

# REVIEW

OF

## APPLIED MYCOLOGY

VOL. XXVI

AUGUST

1947

Roos (K.). **Das Kirschbaumsterben im Baselland. 3. Mitteilung : Infektionsversuche und Bodenuntersuchungen.** [The dying of Cherry trees in the Basle district. Note 3: inoculation experiments and soil analyses.]—*Annu. agric. Suisse*, lx, 5, pp. 500–520, 1946. [French summary.]

The late author's inoculation experiments in 1937 with fungi, bacteria, and dried leaf tissue from affected trees yielded no clue as to the cause of the dying-off of cherry trees in the Basle district of Switzerland [*R.A.M.*, xviii, p. 692], and negative results were also obtained in grafting tests with diseased scions and from the injection of juice from moribund trees. On the other hand, large-scale soil analyses indicated that nutrient deficiency might be the source of the trouble. This supposition was confirmed by K. Meier's unpublished data relating to subsequent researches on this unfinished project.

JENKINS (ANNA E.). **A new species of *Elsinoë* on Capulin cherry.**—*J. Wash. Acad. Sci.*, xxxvii, 3, pp. 86–89, 1 fig., 1947.

A technical diagnosis is given of *Elsinoë pruni* n.sp., the agent of conspicuous, circular to subcircular, coalescent lesions, up to 5 mm. in diameter, vinaceous-buff above and brown to purple below, first observed in 1940 on the leaves of a capulin cherry (*Prunus capuli*) [*P. serotina salicifolia*] tree lately introduced into the Central Experiment Station, Caracas, Venezuela, from Mexico. The asci are subglobose to broadly ovoid or piriform, 22 to 30 by 16 to 22  $\mu$ , and the ascospores fusiform to elliptical, straight or slightly curved, triseptate, hyaline, 14 to 18 by 6 to 8  $\mu$ . The imperfect state, *Sphaceloma pruni* n.sp., is characterized by a palisade usually at least 14  $\mu$  in thickness, of dark-coloured, continuous or septate, rarely geniculate conidiophores, 3 to 5  $\mu$  in diameter, and spherical to narrowly ovoid or fusiform-elliptical, fuscous conidia, up to 15 by 2.6 to 5  $\mu$ .

WEAVER (L. O.). **Effect of temperature and relative humidity on occurrence of blossom blight of stone fruits.**—*Abstr. Thes. Cornell Univ.*, pp. 351–353, 1944. [Received April, 1947.]

Blossom blight of stone fruits (*Prunus* sp.) caused by *Sclerotinia fructicola* [cf. *R.A.M.*, xxi, p. 145; xxvi, pp. 97, 111] is occasionally very serious in New York State. Greenhouse observations were made on potted two- to three-year-old peach or cherry trees, with inoculated blossoms. The germination of the conidia of *S. fructicola* occurred more rapidly on floral parts, particularly on the stigmatic exudate than on potato dextrose agar or glass slides. Contact with water was essential to germination. Conidial germination and mycelial growth occurred at temperatures ranging from 5° to 30° C. with best results at 20° to 25°. Relative humidities above 85 per cent. were needed for spore production; growth was continuous on the agar plates at relative humidities above 96 per cent. *S. fructicola* infected peach blossoms within 18 hours at 10°, 8 to 12 at 15°, 11 at 20°, and 5 at 25° when started in a saturated atmosphere and later removed to one of 40 to 100 per cent. relative humidity, 80 to 90 per cent. being the optimum for

infection. Actual blighting occurred, however, only after a second period in a saturated atmosphere, the lesions becoming dry at 80 per cent. humidity. All floral parts were susceptible and open flowers blighted more readily than those in the pink stage. The percentages of blight on blossoms in the pink stage at 90, 80, and 70 per cent. relative humidity were 43, 27, and 20, respectively. At high humidities infection and blight occurred readily, especially when the stamens and pistil were exposed.

During experiments to determine at what stage of the young developing peach fruit the danger from blossom infection is past it was found that lesions appeared on all floral parts inoculated on the third to tenth day after pollination, but there was only a small percentage of infection on the young fruit when five days had elapsed between pollination and inoculation. A peduncle rot occurred on small green fruits nine and twelve days after pollination after 40 hours in a saturated atmosphere at 19°. Unfertilized fruits blighted readily in all cases.

ORTON (E. C.). **Treatment of iron chlorosis in Currants.**—*Aust. Dried Fruits News*, xxi, 11, p. 5, 1946.

Progress has been made at the Commonwealth Research Station, Merbein, Victoria, in the treatment of iron chlorosis of currants, which occurs periodically on some of the more alkaline 'mallee' [*Eucalyptus*] soils, by the application to pruning cuts, immediately after the operation, of a 20 per cent. iron sulphate solution. Cincturing cuts may be similarly treated. Shallow rooting should be encouraged, and cover crops should not be turned in until after the second irrigation, preferably by rotary hoeing.

TILEMANS (E.). **Les pulvérisations en arboriculture fruitière. (Appareils — conditions de traitement — produits.)** [Spraying in relation to fruit-tree growing. (Machines—conditions of treatment—materials).]—*Fruit belge*, xiii, 63, pp. 122–130, 1945. [Received April, 1947.]

The most serious disease of apples and pears in Belgium is scab [*Venturia inaequalis* and *V. pirina*, respectively], which lowers the value of about one-quarter of the yield, on an average, in addition to causing losses in storage. Various aspects of the problem of spraying are discussed, including the general arrangement of orchards, how to calculate the amount of fluid delivered by a spray, and how much liquid is required, loss of liquid during spraying, the employment of the spray gun, the training of labour, and the use of dusts.

KOVACHE (A.) & FICHEROULLE (H.). **Sur l'utilisation des produits mouillants et des adhésifs comme adjuvants aux bouillies agricoles.** [On the utilization of wetters and stickers as adjuvants for agricultural mixtures.]—*Ann. Épiphyt.*, N.S., xi, 3–4, pp. 235–243, 1945. [Received April, 1947.]

Details are given of tests carried out with various commercial adhesives in France, which showed that as a general rule the materials in question are simply wetters, the effect of which, if they are used at high dosages, is to reduce the tenacity of the deposits. Only a few thousandth parts of these materials are required to increase the wettability of a mixture, i.e., its initial retention; at such dosages there is no effect on the final tenacity of the deposit. No adverse effect on initial retention resulted from high dosages, but weak ones are clearly indicated. Certain emulsified oils greatly increased the tenacity of the deposits without having any marked effect on wettability. For example, materials containing 83 per cent. mineral oils and 17 per cent. emulsifier used at 2.5 or 5 per cent., or 95 per cent. anthracene oil without phenols and made miscible with Bordeaux mixture by means of 5 per cent. of emulsifier and used at 6 or 10 per cent., or a material containing 80 per cent. white mineral oil of emulsified paraffin type used at 1 or 2 per

cent., one containing 52 per cent. coal oil and 15 per cent. anthracene oil emulsified with 20 per cent. colophane soap and used at 1 or 5 per cent., all made the adhesiveness of Bordeaux mixture nearly perfect under the experimental conditions. The last two markedly improved the poor adhesiveness of arsenical mixtures.

TURNBULL (J.). '**Automatic**' fruit tree spraying.—*J. Minist. Agric.*, liv, 1, pp. 36–37, 1947.

A description is given of nozzle arrangements for 'automatic' spraying from a tractor in orchards [*R.A.M.*, xxv, p. 567 and preceding abstract]. This method failed earlier because the machines were too small, but it is successful now that the Ministry of Agriculture has supplied large mobile outfits for use by War Agricultural Committees and some growers have obtained larger machines. The nozzle which is kept stationary after adjustment is most popular and simpler than the moving device. A table of output requirements is given, the 20 gal. per minute machine being the most suitable for bush trees, while for trees larger than 30 ft. across the 40 gal. per minute machine must be used, though the 20-gal. is adequate if all nozzles are directed to one side.

For bush trees six single nozzles a side with No. 4 disks, spaced 9 in. apart, or three double 1 ft. apart are required; for half-standards six to ten single nozzles with No. 5 disks or eight with No. 6 disks all spaced  $4\frac{1}{2}$  in. apart or half the number of double nozzles 9 in. apart. Seven-hole swirl plates and  $\frac{1}{4}$ -in. washers are necessary for the larger trees. When the correct fittings have been inserted to carry the spray effectively the nozzles are adjusted to give a complete fan of spray.

HAMBLIN (D. O.). **Toxicology of insecticides and fungicides.**—*Agric. Chemicals*, i, 6, pp. 28–31, 1946.

The author draws attention to the danger to human beings attendant upon the use of certain chemicals as insecticides and fungicides. After citing a definition of 'poison', he shows how poisons act upon the human body and describes the effects of a few poisons used in plant-disease control upon the different organs of the body. The only approach to the difficult problem of assaying toxicity is by experiment upon animals. This method is briefly described, with an indication of the expense involved, and the author concludes that with the information so obtained, products can be intelligently labelled so that they may be safely used. The [American] Manufacturing Chemists' Association has recently completed carefully worked out recommendations for the standard labelling of all chemical compounds at present marketed, and the hope is expressed that this uniform code will be adhered to by all firms concerned. The same organization is now preparing detailed bulletins for the safe handling of toxic products, including remedial measures.

MILES (G. F.). **300 years of chemical seed treatment.**—*Agric. Chemicals*, i, 7, pp. 22–25, 46, 3 figs., 1946.

The author briefly reviews in popular terms the history of seed treatments against fungal and bacterial diseases of plants from before the time of Du Tillot (1775) up to the present. He discusses the properties that a desirable seed disinfectant should possess, and touches upon future prospects. He describes the slurry or aqueous-suspension method of treating maize seed in which the amount of water applied to the seed is only about 0.5 per cent. of the weight of the seed, or about  $\frac{1}{4}$  pt. water per bush. The treated seed is not even noticeably damp. The method employs water merely to facilitate the coating of the seed with the disinfectant. The substitution of water for talc or other inert powder fillers has two great advantages, in that it eliminates flying dust and ensures accuracy of dosage. The treating

machine synchronizes the flow of seed, so that each unit of maize receives the appropriate amount of suspension.

NELSON (A.). **Principles of agricultural botany.**—xvii+556 pp., 145 pl. (17 col.), 76 figs., 79 diags., 26 graphs, 1 map, London, Edinburgh, &c., Thomas Nelson & Sons, Ltd., 1946. 35s.

Comprised in this valuable treatise are references to various subjects of phytopathological interest, including mineral deficiencies, mycorrhiza, pathological conditions of environmental origin, virus and fungal diseases, and plant-breeding.

SKINNER (C. E.), EMMONS (C. W.), & TSUCHIYA (H. M.). **Henrici's Molds, Yeasts and Actinomycetes.**—xiv+409 pp., 136 figs., New York, J. Wiley & Sons, Inc., London, Chapman & Hall, Ltd., 1947. \$5.00.

This book is a revision of Henrici's original work [cf. *R.A.M.*, x, p. 257] completely rewritten by the above three authors aided by Henrici's own notes. There is an addition of three entirely new chapters and some portions of the original are deleted. The stress on medical and industrial applications of mycology has been intensified and the discussions of life-cycles in the first chapter expanded. The three new chapters are on antibiotic substances, pathogenic yeast-like fungi, and variations in the lower fungi, while fungus diseases of man and animals has been expanded into two chapters.

ZOBELL (C. E.). **Marine microbiology. A monograph on hydrobacteriology.**—xv+240 pp., 1 fig., 6 diags., 6 graphs, Chronica Botanica Company, Waltham, Mass., 1946. \$5.

This treatise, to which a foreword is contributed by S. A. Waksman, represents an attempt to summarize and correlate the extensive literature on marine microbiology, and comprises chapters on aquatic yeasts and moulds (IX); the relation of marine bacteria to flora and fauna (XIV), with a note on some destructive fungal pathogens of fresh-water fish and other animals; and the economic importance of marine micro-organisms (XVII), including those responsible for the decay of cordage and fishing-nets [cf. *R.A.M.*, xv, p. 505 *et passim*]. A 22-page bibliography is appended.

SARASOLA (A. A.). **Un método práctico para el cultivo aséptico de plantas.** [A practical method for the aseptic cultivation of plants.]—*Bol. Soc. argent. Bot.*, i, 4, pp. 303–311, 2 figs., 1946.

Seedlings of numerous species of plants were grown on a medium of sterilized garden soil in test tubes, 20 by 2.5 cm., light and heat being provided by 100-watt electric lamps, and used with successful results in inoculation experiments with species of *Cercospora*, *Botrytis*, *Ovularia*, *Albugo* [*Cystopus*], *Melampsora*, and *Ascochyta*.

DORRELL (W. W.) & PAGE (R. M.). **The use of fragmented mycelial inoculum in the culture of fungi.**—*J. Bact.*, liii, 3, pp. 360–361, 1 diag., 1947.

Using a Waring 'blendor', on which the normal vessel was replaced by a 1-qt. 'duraglass' fruit jar cut to hold the blending blades and connected with a culture bottle containing a well-developed mycelium of the particular fungus required as inoculum, the writers obtained substantial quantities of aseptic material for this purpose by passage through the jar in 200- to 300-ml. lots, one minute's mincing, and passage out into a dispensing vessel. In mass liquid cultures of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] the replacement of spores by 1 per cent. minced mycelial inoculum resulted in a twofold increase in the yield of mycelium

in two-thirds the time. By one minute's mincing of 50 ml. of a five- to six-day-old mycelial culture of *Gibberella zeae* in a shaker flask, approximately 1 to 1.5 by  $10^6$  mycelial fragments per ml. were obtained and found, after aseptic centrifuging and washing, to consist of 3- to 10-cell units, completely viable and capable of germination at many points. Inoculation with 2 per cent. of such a preparation gave a maximum mycelial yield.

GUPTA (B. M.). **A method of sealing tubes of fungal cultures to increase their longevity.**—*Curr. Sci.*, xvi, 3, pp. 94-95, 3 figs., 1947.

This new method tested in New Delhi enables fungus cultures in tubes to remain viable for at least eight months at room temperature. Pieces of cellophane, sufficient to cover part of the test tube wall as well as the mouth, are sterilized with alcohol. An aqueous solution containing 15 per cent. gelatine and 2 per cent. copper sulphate is used as an adhesive [cf. *R.A.M.*, xxvi, p. 22]. The tube is first plugged with cotton-wool while the culture is growing, this is then removed aseptically after about a week, the mouth dipped in the gelatine solution, sealed by the cellophane, and finally dipped in hot paraffin wax, the process being completed in only 15 seconds. The growth of the fungus is checked but is resumed when the seal is replaced by a cotton-wool plug.

MCCARTNEY (J. E.). **Culture media and the cultivation of micro-organisms.**—*J. Quekett micr. Cl.*, Ser. 4, ii, 3, pp. 132-142, 2 figs., 1946 (issued 1947).

This semi-popular account includes a description of the methods devised by the author, and used in the medical services during the war, for the centralized preparation of culture media and their despatch to the allied armies overseas. Test tubes and flasks, too fragile for this purpose, were replaced by bottles of suitable forms and sizes, closed by aluminium screw-caps with rubber washers. Bottles of  $\frac{1}{4}$ - and  $\frac{1}{2}$ -oz. capacity were used for individual slants, larger sizes for plates, and 4- and 10-oz. bottles for agar in bulk. 'Tubed' media do not dry up in these bottles during prolonged storage before use. The different media were distinguished either by bands of cellulose paint of various colours on the caps or by coloured glass beads, one bead being placed with the medium in each container.

MILLER (J. J.), KOCH (L. W.), & HILDEBRAND (A. A.). **A comparison of cultural methods for the maintenance of certain economic fungi.**—*Sci. Agric.*, xxvii, 2, pp. 74-80, 1947.

This account deals with the maintenance of fungus cultures in tubes of sterilized soil as compared with the usual laboratory method of serial transfers on a nutrient-rich agar medium with regard to preventing loss of original strains through mutation. The fungi studied were *Thielaviopsis basicola*, *Septoria glycines*, *Penicillium notatum*, and the muskmelon *Fusarium* [*F. bulbigenum* var. *niveum*: *R.A.M.*, xxvi, p. 218]. Three media, potato dextrose agar, soil infusion agar, and moist sterilized soil, were used, the agars being dispersed in test-tube slants and the soil added to test tubes to within an inch of the top. Suspensions from young, growing, single-spore cultures were prepared in sterilized, distilled water, and were thus introduced into the culture tubes. The cultures were transferred five times in nine months; some were kept on for a further six months with four transfers; one set of soil tubes was not transferred. There were four replicates of each combination of organism and cultural treatment and at the end of this period the fungus population was studied by making single-spore or hyphal-tip isolates from each tube on to potato dextrose agar.

*T. basicola* failed to remain viable in either the transferred or non-transferred soil tubes, being probably unable to withstand dryness as the soil, although moist at inoculation, became dry in two or three weeks. It was noticed that the mutants

appearing in potato dextrose agar and soil infusion agar were lighter in colour than the parent type, had different cultural characters and sporulation, and produced fewer endoconidia. None of the mutants was capable of causing such serious infection as the parent types.

*S. glycines* was viable for six months in soil cultures. It was very unstable on potato dextrose and soil infusion agars but the original type was still pure after nine months in sterilized soil. The mutants varied considerably from dark cultures similar to the parent types to sterile, albino types.

*P. notatum* was the most stable of the four, few mutants being obtained from soil infusion agar after 15 months, but it was as unstable as the others on potato dextrose agar.

*F. bulbigenum* var. *niveum* was found to be similar to *P. notatum* in that transferring encourages mutations on the soil medium. In tubes not transferred there were no mutants even after 15 months.

Transference enables *S. glycines* to survive longer. *P. notatum* and *F. bulbigenum* var. *niveum* still survived after 15 months in soil tubes but two months was the viable limit for *T. basicola* on the same medium. Original strains were soon displaced by mutant types on potato dextrose agar and to a lesser degree on soil infusion agar.

ARÊA LEÃO (A. E.), DE MELLO (M. T.), & MAYOR (V.). **Acarianos infestadores de culturas de cogumelos. Biologia — classificação — métodos de combate.** [Acarina infesting fungus cultures. Biology—classification—methods of control.]—*Mem. Inst. Osw. Cruz*, xlii, 3, pp. 559–608, 4 pl., 1946.

A number of fungus cultures infested by mites (probably *Tyroglyphus longior* and *Tarsonemus floricolus*) at the Oswaldo Cruz Institute, Rio de Janeiro, were freed from the mites and re-infestation prevented by the application of kerosene [paraffin] (four to five drops) to the cotton plugs of culture tubes, and in liberal quantities to supports, tables, cupboards, and the like, while Petri dishes should be placed on filter paper soaked in the oil.

Xylene, toluene, benzene, and 'flit' kill the mites immediately but are expensive and inflammable. Paradichlor-benzene is effective in large doses but is inhibitory to fungi besides inducing pleomorphic changes. DDT is ineffective.

A bibliography of 31 titles is appended.

CONKLIN (D. B.). **Ultra-violet irradiation of spores of certain molds collected from bread.**—*Proc. Iowa Acad. Sci.*, li, pp. 185–189, 1944. [Received March, 1947.]

Experiments were carried out to determine the effect of ultra-violet light from a 15-watt General Electric mercury vapour lamp high in 2537 Å radiation on the bread moulds *Aspergillus flavus*, *A. wentii*, *A. niger*, *A. repens*, *A. ruber*, *Rhizopus nigricans* [*R. stolonifer*], and *Penicillium* sp. [*R.A.M.*, xxi, p. 342; xxv, p. 517]. All the species were inactivated by exposures ranging from 1½ to 6 minutes. The thick-walled, heavily pigmented spores of *A. niger* were the most resistant, succumbing only after the full six minutes' treatment, whereas *A. ruber* failed to grow after 1½ minutes and *R. stolonifer* after two, while the rest were intermediate. Intermittent radiation also inactivated the spores when the total exposure equalled in amount the continuous lethal dose.

**Mildew-proofing agent.**—*Chem. Engng News*, xxiv, 20, pp. 2826, 2828, 1946.

Hyamine 3258 (Rohm & Haas, Philadelphia), a water-dispersible quaternary ammonium pentachlorophenate containing 40 per cent. active fungicide, is a light tan paste liquefiable by heating to 80° F. The manufacturers claim that it is effective against a variety of destructive moulds, e.g. on cellar walls and leather goods, and extensive practical use was made of it during the war for the

protection of tents and other military equipment from fungal spoilage in the tropics. A typical mildew-proofing formulation consists of 10 per cent. hyamine 3258 with a small amount of isopropanol and a wetting agent, such as triton X-155, all in water solution. In recent tests, samples of vegetable-tanned leather were swabbed with solutions of the fungicide in various combinations, dried, suspended in a moist chamber, and inoculated with a leather-attacking mould. While the untreated controls developed extensive fungal growths within three days, the samples swabbed with hyamine remained free from contamination throughout the three weeks covered by the experiments.

BABIČKA (J.) & SEMERÁD (A.). **Mikroflora der Rohhäute und Leder. Zusammenfassung.** [Microflora of raw hides and leather. Summary.]—*Bull. Acad. int. Prague*, xliii, pp. 274–275, 1 pl., 1 graph, 1943. [Received April, 1947.]

Among the numerous micro-organisms isolated from raw hides and dressed leather in Czechoslovakia the fungi present (in approximate order of prevalence) were *Mucor mucedo*, *Absidia caerulea* (about equally frequent), *Saccharomyces*, *Oidium* [? *Oospora*], *M. plumbeus* (roughly the same incidence), *Aspergillus roseus*, *Dematium nigrum*, *M. caeruleum*, and *A. niger* [*R.A.M.*, xxv, p. 410].

ETTLINGER (L.). **Zur kulturellen Gewinnung von Penicillin.** [On the cultural production of penicillin.]—*Ber. schweiz. bot. Ges.*, lvi, pp. 681–695, 3 figs., 3 graphs, 1946.

At the Federal Technical College, Zürich, the writer isolated from a laboratory contamination a strain, ETH 1274, of *Penicillium notatum* forming nearly white colonies and few spores. On a medium consisting of Czapek-Dox solution with the addition of 2 per cent. cane sugar, 0.8 per cent. ammonium tartrate, and traces of zinc and copper, it produced in a week 24 Oxford units of penicillin per c.c. Using a laboratory apparatus of ten rotating aluminium milk cans, each with a capacity of 40 l., a maximum quantity of 13,500,000 Oxford units penicillin was obtained in a working period of three days on a medium of wheat bran, water, and inorganic salts.

KOFFLER (H.), KNIGHT (S. G.), & FRAZIER (W. C.). **The effect of certain mineral elements on the production of penicillin in shake flasks.**—*J. Bact.*, liii, 1, pp. 115–123, 1947.

The capacity of maize steep ash for the increase of penicillin production by *Penicillium chrysogenum* X-1612 [*R.A.M.*, xxv, p. 514] in a basal synthetic medium was reproduced by the addition of iron and soluble phosphates. The presence of copper (>2 p.p.m.) in the medium completely prevented the accumulation of penicillin, and the addition of only 1 p.p.m. iron offset the effect of copper. Evidence was forthcoming that this interaction between the two minerals affected the synthesis of the antibiotic rather than its destruction.

WHIFFEN (ALMA J.) & SAVAGE (G. M.). **The relation of natural variation in *Penicillium notatum* to the yield of penicillin in surface culture.**—*J. Bact.*, liii, 2, pp. 231–240, 2 diags., 5 graphs, 1947.

A prolific strain of *Penicillium notatum*, NRRL 1249 B 21 [*R.A.M.*, xxvi, p. 118], when serially subcultured, underwent rapid natural mutation if sporulation was permitted to occur. Mutants sporulating freely and giving low penicillin yields rapidly outgrew the parent type, resulting in a decrease in antibiotic productivity termed 'penicillin run-down'. When sporulation was suppressed, the decline did not occur at any time throughout 50 serial transfer generations.

Continuous selection of clones of maximum productivity from a high-yielding

strain did not result in the isolation of superior strains, the low-yielding mutants derived in this way being much more stable than the parent.

STANLEY (A. R.). **Improving streptomycin yields by strain selection and inoculum development.**—Abs. in *J. Bact.*, liii, 2, p. 254, 1947.

At the Commercial Solvents Corporation, Terre Haute, Indiana, streptomycin yields have been many times increased by strain selection, an original single-colony culture of *Streptomyces griseus* [R.A.M., xxvi, p. 164] giving assays of 100 to 200  $\mu$  gm. per ml., for instance, having thus been induced to yield 400 to 500 regularly. After irradiation with ultra-violet light, colony selection resulted in cultures in which yields of 600 to 800  $\mu$  gm. per ml. were not uncommon, with a maximum for one strain of over 900 in shake flasks. The process of selection was accomplished by the isolation of large numbers of single-colony cultures of the mould and testing them for streptomycin production on the fermentation medium in use in the plant [see next abstract].

BENNETT (R. E.). **Nutrition of *Streptomyces griseus* in relation to streptomycin titre.**—Abs. in *J. Bact.*, liii, 2, p. 254, 1947.

In connexion with pilot-plant production of streptomycin [see preceding abstract], the nutritional requirements of *Streptomyces griseus* were studied with the object of securing the optimum medium. With a selected strain of the mould, substrata in current use, such as maize steep water and peptone, beef extract and peptone, and soy-bean, regularly yielded streptomycin titres of 400  $\mu$  gm. per ml. in shake flasks and 200 to 400 in 300-gal. pilot-plant runs. Media containing an abundance of proteins, preferably in the form of amino acids or polypeptides, are essential for high titres.

JACKSON (L. W. R.). **Method for differential staining of mycorrhizal roots.**—*Science*, cv, 2724, pp. 291–292, 1947.

The author describes a method for improved differential staining of mycorrhizal roots of shortleaf pine (*Pinus echinata*) [R.A.M., xxii, p. 492; xxiv, pp. 296, 297]. The roots are fixed in acetic-formalin-alcohol solution and embedded in paraffin. The slides are stained in safranin (3 ml. of a 0.5 per cent. aqueous solution in 70 ml. water) for 30 minutes, washed, stained with Cartwright's picro-aniline blue (3 ml. in 70 ml. water) for 5 to 10 minutes, washed, dehydrated, and cleared and mounted in diaphane. Thus the blue-staining hyphae are clearly contrasted with the red-staining elements of the short roots, the dark-coloured hyphae of the pseudomycorrhizal fungi remaining unstained. Differentiation of the intracellular hyphae was obtained by using a Wratten B (No. 58) filter.

The results suggest that the foliar decline diseases of pine [loc. cit.] may be related to a reversal of symbiosis [ibid., xxiv, p. 29] which causes a parasitic phase of mycorrhizal fungi on the short roots under unfavourable conditions.

KAUFFMANN-COSLA (O.) & VASILIU-VÁLCEA (N.). **L'action du magnésium sur la biologie cellulaire. IIIème contribution.** [The action of magnesium on cellular biology. Second contribution.]—*Anal. Acad. române*, Ser. iii, xvi, Mem. 8, 134 pp., 9 pl., 12 graphs, 1940. [Received April, 1947.]

Experimental evidence showed that when *Aspergillus niger* was grown on Raulin's mixture containing different proportions of magnesium, after 96 hours, sporulation was extremely abundant in the medium containing 0.026 per cent. magnesium, abundant in that with 0.0068 to 0.0017 per cent., sparse in that with 0.00099 per cent., and absent in that with 0.00034 or 0.00024 per cent. It is concluded that reproductive ability or sterility in *A. niger* was conditioned by the amount of magnesium in the medium.

FRIES (N.) & TROLLE (ULLA). **Combination experiments with mutant strains of *Ophiostoma multiannulatum*.**—*Hereditas*, xxxiii, 3, pp. 377–384, 1947.

In further experiments on mutation in *Ceratostomella multiannulata* [*R.A.M.*, xxv, p. 520], a prototrophic ('wild-type') mycelium developed on malt agar in 14 out of 37 'illegitimate' combinations (between theoretically incompatible mycelial groups) of different physiological variants of the fungus, heterotrophic in respect of uracil, hypoxanthine, adenine, and guanine. A segregation in the perithecial rudiments is presumed to have been responsible for the phenomenon. Heterokaryotic hyphae could not be detected either in these combinations or in those on synthetic nutrient agar, though in 13 out of the 31 last-named some growth was made, probably through the formation of extracellular symbioses.

GÄUMANN (E.) & BÖHNI (ERIKA). **Über adaptive Enzyme bei parasitischen Pilzen. I.** [On adaptive enzymes in parasitic fungi. I.]—*Helv. chim. Acta*, xxx, 1, pp. 24–38, 6 graphs, 1947.

Experiments were carried out to ascertain whether and to what extent the production of pectinase and pectase by *Botrytis cinerea* is affected by the pectin content of a particular nutrient solution. The results showed that pectinase, which splits the pectate chain, is a constitutive enzyme, developing independently of the chemical composition of the medium. On the other hand, the non-specific pectase, which splits the methyl alcohol in pectin, proved to be largely adaptive, being produced in abundance in the presence of pectin but only in traces without it.

NEWTON (W.) & LINES (C.). **The dusting of cut Potato tubers as a preventive against *Pythium* rot.**—*Sci. Agric.*, xxvii, 2, pp. 72, 73, 1947.

Rotting of potato sets caused by *Pythium ultimum* [*R.A.M.*, xiv, p. 605] causes heavy losses in the coastal regions of British Columbia especially when planted in heavy soils and with subsequent wet weather. Experiments showed that when seed pieces were dusted with various materials and planted in soil inoculated with *P. ultimum* [*ibid.*, xx, p. 489], fermate prevented rotting (21 per cent. infection), with spergon (39) and arasan (40) next, the untreated showing 84 per cent. infection. Hydrated lime, sulphur, dithane, and semesan bel had very little effect, while copper oxide merely aggravated the rot. The results show that the usual dusting of cut tubers, prior to planting, with hydrated lime or sulphur is valueless in preventing the *Pythium* rot.

YOUNKIN (S. G.). **Suscept range of the Potato yellow dwarf virus.**—*Abstr. Thes. Cornell Univ.*, pp. 354–356, 1944. [Received April, 1947.]

This study was concerned with (1) the development of a means of recovery and identification of the potato yellow dwarf virus [*R.A.M.*, xxv, p. 180], (2) determination of the susceptibility of weeds and crop plants to the virus, and (3) determination of the importance of the different susceptibles as virus reservoirs under field conditions.

The development of lesions on *Nicotiana rustica*, used as a test plant, occurred most readily at 75° to 80° F. and increased when the leaves were dusted with 600-mesh carborundum before inoculation. A decrease in virus activity resulted during exposure of crude sap extracts from *N. rustica* plants for 15 minutes; more lesions were produced when the inoculated plants were placed in the dark. Of 153 cultivated and uncultivated species of plants tested for susceptibility to the New York and New Jersey strains of the virus the following were reported as susceptible for the first time: buckwheat, rape and other *Brassica* species, radish, clover and vetch species, flax, carrot, *Chrysanthemum leucanthemum* var. *pinnatifidum* and other *C.* species, and salsify.

Symptoms included vein-clearing, vein necrosis, and general necrosis, although some varieties only tended to be stunted. Under field conditions *C. leucanthemum*

var. *pinnatifidum* was found to be commonly infected with the virus, only half of the infected plants showing symptoms. In one case the appearance of infective clover leafhoppers [*Aceratagallia sanguinolenta*] in a clover field was correlated with the appearance of the disease on this plant in the same field. Infected plants of *C. leucanthemum* var. *pinnatifidum* overwinter and provide a source of virus in the following spring. This variety is most abundant in central and western New York State where the yellow dwarf disease of potatoes has been most destructive. Clover plants are relatively unimportant as virus reservoirs.

VAUGHN (J. R.) & LEACH (J. G.). **A comparison of certain Potato sprays in different localities in West Virginia.**—*Amer. Potato J.*, xxiv, 3, pp. 76–82, 1947.

Various materials were combined with DDT in experiments to find an efficient control for late blight of potatoes [*Phytophthora infestans*: *R.A.M.*, xxvi, p. 212] other than Bordeaux mixture. The DDT was used at the rate of  $\frac{3}{4}$  lb. per 100 gals. spray and Bordeaux at 8–8–100. In 1945 at Reedsville where late blight was more severe than in 1946, the dithane plus DDT plots yielded nearly 400 bush. per acre, outyielding Bordeaux plus DDT and Bordeaux alone by 39 and 58 bush. per acre, respectively. In 1946 the Bordeaux plus DDT plots slightly outyielded dithane plus DDT plots which had a total yield of about 250 bush. per acre, but the latter exceeded those receiving Bordeaux alone by 56 bush. per acre. At Graham Station in 1945 dithane plus DDT again gave the best results, the plots yielding over 300 bush. per acre, 21 more than Bordeaux plus DDT, but at Huttonsville in 1946, Bordeaux plus DDT, yielding over 200 bush. per acre, slightly outyielded dithane plus DDT, which outyielded Bordeaux alone by 34 bush. per acre. Here, in 1946, dithane plus DDT was applied to 50 acres of a 90-acre commercial potato field and its failure to control the blight was very surprising. One possible reason may have been that an extremely heavy epidemic occurred, coinciding with the unusually rainy period, giving the material too severe a test. According to the manufacturers, dithane needs lower pressures and slower driving speeds than are usually employed. It seems, too, that it needs different conditions from Bordeaux and is useful as a protectant in some areas but would probably give better results generally in the form of dithane HE 178E.

In testing 12 different fungicides in various combinations, fixed copper plus DDT and chromate 518 plus lime gave the best results, with chromates 169E and 169A next, but none of these significantly surpassed Bordeaux plus DDT.

BJÖRLING (K.). **Inventeringar av växtsjukdomar i odlingar av Fabrikspotatis.** [List of plant diseases in plantings of factory Potatoes.]—*Medd. Växtskyddsanst., Stockh.*, 47, 16 pp., 1 map, 1946.

In the south of Sweden the industrial potato crop is largely concentrated in eastern Scania and large areas of Blekinge attached to some 120 small and medium-sized starch factories. Within these limits 364 experimental fields were selected from 285 plantings in 15 manufacturing districts for disease, varietal purity, and yield determinations, and two surveys were made, one covering the last week in July and the first fortnight of August, 1945, and the other extending from 22nd September, 1945, to 10th February, 1946.

Only in 64 plantings were the varieties (17 in all) entirely free from admixtures. The summer inspections disclosed the presence of the three principal virus diseases, leaf roll [*R.A.M.*, vi, p. 370; xxv, pp. 26, 77, *et passim*], streak [virus Y: *ibid.*, xxvi, p. 207], and crinkle either separately or together in about two-thirds of the plantings causing averages of 0.9, 0.9, and 2.2 per cent. infection, respectively. The most virulent outbreaks of crinkle developed in two plantings of Stärkereiche I (26.5 per cent.) and four of Gloria (10), the percentages for the leading varieties, Parnassia and Wohltmann, being 1.6 and 1.7, respectively, and for the three next

in frequency, Voran, Ostbote, and Alpha, 2.8, 2.4, and 2.9 per cent., respectively. Mild mosaic [potato virus X: loc. cit.] was observed in 154 plantings and classified as 'general' in 37, or 10 per cent., of the total included in the survey.

Blackleg (*Bacillus phytophthorus*) [*Erwinia phytophthora*] was evenly distributed over the entire experimental area, involving 84 per cent. of the plantings, with an average incidence of 1.2 (maximum 9) per cent. The intensity of late blight (*Phytophthora infestans*) reached a maximum of 2 to 3 (average 1.7 in a scale 0 to 5) in about half the plantings in Scania. *Rhizoctonia* [*Corticium*] *solanii* occurred sporadically in some 40 per cent. of the plantings uniformly distributed over the whole area.

Manganese deficiency [ibid., xxiv, p. 385] was present in an acute form in 61 plantings (17 per cent.), mostly situated in a tract beginning in the plains south of Kristianstad and including north-east Scania, the Tvärskog district, Listerland, and part of western Blekinge. Scab (*Actinomyces* spp. [including *A. scabies*: ibid., xxv, pp. 77]) occurred on 40 per cent. of the plantings in the manganese-deficiency tract compared with 25 per cent. in the rest of the area under observation, a similar correlation being noted in respect of black scurf (*C. solani*).

Josefsson's theory of an association between internal rust spot and manganese deficiency [ibid., xxiv, p. 385] was not corroborated by the results of the present investigation. Of the samples from 52 plantings with manganese-deficiency symptoms, only four showed internal rust spot, which was present, on the other hand, in 13 from 281 plantings unaffected by the deficiency.

Of the diseases enumerated, the viruses, late blight and tuber-rot, and magnesium deficiency may be regarded as limiting factors in starch-production. Exact figures for the crop reductions caused by the several disorders are not available, but a conservative estimate rates them at over rather than under 10 per cent.

ANDERSON (A. L.), HENRY (B. W.), & TULLIS (E. C.). **Factors affecting infectivity, spread, and persistence of *Piricularia oryzae* Cav.**—*Phytopathology*, xxxvii, 2, pp. 94–110, 1 fig., 1947.

A tabulated account is given of greenhouse and field inoculation experiments (the latter at Beaumont, Texas) on rice plants in 1944 and 1945 with *Piricularia oryzae*, applied either in the form of a conidial suspension in sodium oleate-gelatine (0.05:0.25 per cent.) solution [*R.A.M.*, xxvi, p. 167] at the rate of 1,000,000 conidia per sq. ft. or as filter-cake dust from an admixture of finely ground, black, neutral peat with a fungal suspension (2,500,000 conidia per sq. ft.). In the greenhouse tests on the Acadia and Onsen varieties, a humidity tent was used to provide favourable conditions for the establishment of infection of the plants. It consisted of a muslin cover wetted by an external overhead sprinkling system and supported by a steel frame over a deep, water-tight bench. A water humidifier maintained a high humidity within the tent and the temperatures were adjusted to a range of 22° to 28° C.

The plants were most susceptible to blast in the seedling, early tillering, and heading stages [ibid., xvii, p. 767]. Under the conditions described, the maximum degree of infection was obtained from 16 to 24 hours' exposure of the plants to continuous wetness, while none resulted from less than ten hours. Inoculated plants exposed to eight hours' wetting, followed by a dry and a second wet period, contracted from 30 to 50 per cent. of the maximum incidence of infection. Under very humid conditions, permitting the presence of free moisture on the leaves, a 21½- (but not a 15-) hour exposure resulted in secondary spread and the establishment of a high degree of infection. A minimum period of six days after inoculation was requisite for the development of the lesions to a stage capable of producing conidia to serve as inoculum for the secondary spread of the disease. The conidia retained their viability on dry plants for six days in the greenhouse. In suspension

there was a rapid decrease of viability during the first 24 hours at 28° to 32°: these being below the normal temperatures of irrigation water in Texas rice fields, the survival of the conidia in this medium for a longer period is considered improbable and the risk of conidial dissemination through such a channel remote [cf. *ibid.*, viii, p. 461.]

No antagonism was observed between the conidia of *P. oryzae* and those of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] growing in conjunction on rice-polish agar or germinating together in water. When the two pathogens were combined for use in plant inoculation, *O. miyabeanus* reduced the amount of infection caused by *P. oryzae*.

Of 17 Japanese short- and two American medium-grain varieties tested in the three- to five-leaf stage for their reactions to *P. oryzae*, 11 were placed in the very susceptible or susceptible categories, one (Butter) was classed as resistant, and the remainder were intermediate in response to inoculation. Barley, maize, rye, and wheat seedlings also proved susceptible to infection by the blast fungus.

MELCHERS (W. J.) & GERRITSEN (H. J.). **Koper als onmisbaar element voor plant en dier.** [Copper as an indispensable element for plants and livestock.]—56 pp., 24 figs. (5 col.), 1 diag., Wageningen, N.V. Drukkerij 'Vada', 1944. Fl. 1.90. [German, French, and English summaries. Received April, 1947.]

This is a valuable survey of the information accumulated, chiefly in Holland, on the disorders of agricultural crops and livestock associated with copper deficiency (reclamation disease) in the soil. Many references to the phytopathological aspects of the subject have appeared from time to time in this *Review*.

BRADFIELD (J. R. G.). **Plant carbonic anhydrase.**—*Nature, Lond.*, clix, 4040, pp. 467–468, 2 graphs, 1947.

During a study of the distribution of carbonic anhydrase in plants the author noted that among those known to contain the enzyme are several, e.g., grapefruit, peach, tomato, which are subject to diseases such as mottle leaf and little leaf, attributed to zinc deficiency. Animal carbonic anhydrase contains zinc and if the plant enzyme also contains this element the author suggests that it would be interesting to examine the anhydrase content of zinc-deficient plants.

LING (L.). **Host index of the parasitic fungi of Szechuan.**—*Nanking J.*, xi, 3, pp. 117–142, 1942. [Received December, 1946.]

This index [cf. *R.A.M.*, xxii, p. 327], a contribution from the Division of Plant Pathology and Economic Entomology, Szechuan Provincial Agricultural Improvement Institute, Chengtu, China, is based mainly on observations and collections made during numerous tours of inspection between 1937 and 1941. The host genera are arranged in alphabetical order of their scientific names, and the fungi are listed, also alphabetically, under their respective hosts.

SĂVULESCU (T.). & SĂVULESCU (OLGA). **Matériaux pour la flore des Urédinées de Roumanie.** [Materials for the flora of the Uredineae of Rumania.]—*Mem. Sect. sci. Acad. roum.*, Ser. 3, xvii, pp. 113–149, 18 figs., 1942. [Received February, 1947.]

This is a critically annotated list of 345 rusts collected in Rumania [cf. *R.A.M.*, xix, pp. 365, 729] on 629 hosts belonging to 47 families.

JENKINS (ANNA E.) & BITANCOURT (A. A.). **Observações sobre espécies do gênero 'Elsinoë' de Uganda.** [Observations on species of the genus *Elsinoe* of Uganda.]—*Arq. Inst. biol., S. Paulo*, xvii, 3, pp. 47–54, 2 pl., 1946. [English summary.]

Latin and Portuguese diagnoses are given of six species of *Elsinoe* collected in Uganda by C. H. Hansford (*Mycol. Pap., Imp. mycol. Inst.*, 15, 1946), including *E. sidae*, the agent of a foliar scab of *Sida cordifolia*.

UBRIZSY (G.). **Adatok a Nyírség lisztharmatgombainak (Erysiphaceae) ismeretéhez.**

[Contributions to the knowledge of the Erysiphaceae of Nyírség.]—*Acta mycol. hung.*, iii, 1-4, pp. 28-33, 1946.

The incidence of powdery mildews in the Nyírség region of the great plain of Hungary is favoured by heavy dews, injury to the aerial parts of plants by wind-blown sand, close cropping, and abundant summer sunshine. Incidence of infection was notably less in the shade. Among the 24 species listed [cf. *R.A.M.*, xxvi, p. 80], *Uncinula necator* on vine, *Sphaerotheca pannosa* var. *rosae* on roses, *S. p.* var. *persicae* on peach, *Podosphaera leucotricha* on apple, and *Microsphaera abbreviata* on young oak seedlings cause considerable losses locally. Others of interest are *Erysiphe artemisiae* on *Artemisia vulgaris*, *E. cichoracearum* on dandelion (*Taraxacum officinale*), cucumber, melon, watermelon, and marrow, *E. communis* on horse-radish and charlock, *E. horridula* on *Echium vulgare*, *E. pisi* [*E. polygoni*] on pea, *E. urticae* on nettle, *E. martii* on *Lotus corniculatus*, *Melilotus albus*, and *Robinia pseud-acacia*, and *E. graminis* on wheat, *Microsphaera berberidis* on *Berberis* spp., *M. lonicerae* on *Lonicera* sp., *Phyllactinia suffulta* on snowberry (*Symphoricarpos racemosus*) [*S. albus*] and lilac [ibid., xxv, p. 329], *S. humuli* on hops, *S. mors-uvae* on gooseberry, *Trichocladia* [*Erysiphe*] *tortilis* on *Cornus sanguinea*, *U. prunastri* on plum and *Prunus spinata* var. *dasyphylla*, *U. salicis* on poplar (*Populus italica*), *Podosphaera* [*oxycantha* var.] *tridactyla* on plum, and *Oidium euonymi-japonicae* on *Euonymus japonica* [ibid., xix, p. 297].

JENKINS (ANNA E.) & BITANCOURT (A. A.). **Duas verrugoses do Chá, causadas por 'Elsinoe', e sua distribuição.** [Two Tea scabs caused by *Elsinoe* and their distribution.]—*Arq. Inst. biol.*, S. Paulo, xvii, 5, pp. 67-72, 1 pl., 1946. [English summary.]

From a study of specimens and published records it is concluded that mottle scab of tea (*Elsinoe theae*) occurs in Ceylon [*R.A.M.*, xx, p. 599]; Kangra Valley, Punjab, India, where it was described by Chaudhuri *et al.* [ibid., xvii, p. 71] as 'scabbing of leaves'; Uganda (included by Hansford in his list of parasitic fungi [ibid., xxiii, p. 79]); Tanganyika Territory [ibid., xx, p. 573]; Nyasaland ('leaf scab') [ibid., vii, p. 275]; and São Paulo, Brazil [ibid., xix, p. 369].

The white scab attributed by Kurosawa in Japan to *Sphaceloma theae* (*Ann. phytopath. Soc. Japan*, ix, pp. 131-132, 1939) appears to be distinct from mottle scab, and specimens received from Guatemala have been identified as the former. The fungus present on this material in the perfect and conidial states is described as a new species, *E. leucospila* Bitanc. & Jenk. (*S. theae* Kurosawa). It forms on the leaves scattered, sometimes confluent, circular or somewhat irregular, raised, smooth or slightly rugose, occasionally fissile spots, up to 4 mm. in diameter, with white or dirty white centres and a Natal-brown margin; superimposed on the periphery of the centres are the gonidia of the alga *Cephaleuros virescens* [*C. mycoidea*], which impart a glass-green to Chartreuse-yellow tint to the tissues. The erumpent, pulvinate, hyaline, pseudoparenchymatous ascomata, 50 to 100  $\mu$  in diameter and 50 to 80  $\mu$  in height, are occupied by globose asci, 20 to 50  $\mu$  in diameter, containing eight hyaline, bi- to triseptate ascospores, the median cells sometimes furnished with longitudinal septa, 13 to 16 by 5 to 7  $\mu$ . The imperfect state is represented by acervuli or sporodochia composed of a palisade of coalescent, fuscous, usually uniseptate conidiophores, 15 by 3  $\mu$ , arising from a fuscous pseudoparenchyma; conidia were not observed.

SUBBA RAO (M. K.). **Blister blight of Tea in South India.**—*Pap. Unit. Plant Ass. Sth. India* (*Tea sci. Sect.*) 4, ii+14+iii pp., 6 figs., 1 diag., 1 map, 1946.

In connexion with the first outbreak of blister blight (*Exobasidium vexans*) on tea in South India in August, 1946, the available information on the etiology,

symptomatology, effects, origin, and control of the disease in the north-east of the country is summarized from the relevant literature [*R.A.M.*, iv, pp. 4, 432; vii, p. 542]. Exceptionally wet conditions prevailed during the period of the epidemic, which persisted until late in November and caused heavy losses, estimated on two medium-sized estates to have ranged from 5,000 lb. made tea in August to 20,000 lb. in September.

The following are some recommendations for the control of the disease, based on experience in Assam adapted to local conditions. Pruning during the period from February to May should be avoided in view of the high susceptibility to infection of the resultant new growth. Contaminated prunings should be buried or burned. Rim-lung pruning should not be practised, the young foliage of the 'lungs' or 'breathers' being a potential source of infection. Excessively dense shade should be reduced by thinning-out. Spraying with Bordeaux or Burgundy mixture or perenox should be done in May, two applications being given on estates, with a fortnight's interval, while in nurseries monthly spraying in the dry weather and fortnightly in the wet season is advised. Picking and destruction of diseased leaves and shoots should be continued throughout the year, since the plucking surface of mature tea may be infected at any time, particularly under dense shade or under humid conditions. Recurrent outbreaks in isolated areas should be combated by spraying the affected bushes (after removal of all diseased material) and about four or five rows of the surrounding tea at 10- to 14-day intervals. The provision of spraying equipment adapted to large-scale operations is essential to blister-blight control. All tea seed should be treated with a fungicidal dust, such as agrosan G.N. supplied by Imperial Chemical Industries (India) Ltd., or harvesan (Boots Pure Drug & Chemical Ltd.). The co-operation of neighbouring estates should be sought in the control of the disease at all stages, since the fungus spreads rapidly and causes serious damage within a very short time.

WYCKOFF (R. W. G.). **Electron micrographs from concentrated solutions of the Tobacco mosaic virus protein.**—*Biochim. biophys. Acta*, i, 2, pp. 139-146, 5 figs., 1947. [French and German summaries.]

Shadowed metal replicas and freeze-drying can be used to make preparations of which the electron micrographs show the molecular particle arrangement in concentrated solutions of the tobacco-mosaic virus protein and in films dried from such solutions [*R.A.M.*, xxvi, p. 268]. The preliminary figures of the preparations in question here reproduced present continuous bidimensional sheets and other regularities in particle alignment.

SMITH (K. M.). **The transmission of a plant virus complex by aphides.**—*Parasitology*, xxxvii, 3, 4, pp. 131-134, 1946.

This a full account of work previously published in an abbreviated form [*R.A.M.*, xxiv, p. 208] on the tobacco rosette virus-disease complex. In the transmission experiments it was found that the aphid *Myzus convolvuli* is also a vector of the tobacco rosette disease. Experiments with *Datura stramonium* showed that this plant is susceptible to the mottle virus but is resistant to the vein-distorting virus of the complex; thus, the aphid can pick up both viruses from an infected plant for a little while but as soon as the vein-distorting virus has lost its infectiveness it cannot pick up the mottle virus from the same plant.

RAMAKRISHNAN (T. S.) & SOUMINI (C. K.). **Fruit rot of Tomatoes caused by *Phytophthora palmivora* Butl.**—*Proc. Indian Acad. Sci.*, Sect. B, xxv, 2, pp. 39-42, 1 pl., 4 figs., 1947.

A rot of tomato fruits was observed in the Coimbatore district during the rainy seasons of 1944 and 1945. Infection originated on the fruits of the lower branches

in contact with the soil, nearly 25 per cent. of which were attacked, and subsequently spread to those of the upper ones. A few stems and branches in proximity to the ground also turned dark brown and decayed. On green fruits the small, water-soaked spots produced at the blossom end or the part touching the soil rapidly enlarge and in three or four days cover the whole surface. The diseased tomatoes acquire a brownish tinge, feel soft to the touch, and the skin readily peels off. A white, flocculent, superficial, growth develops in wet weather. A concentric pattern may be formed in the affected areas.

The causal organism was isolated in pure culture from a single sporangium. It grew well on oat and French bean agars, producing numerous oval or piriform, papillate, mostly terminal sporangia, 18.6 to 46.5 by 15.5 to 37.2 (mean 33.4 by 22.6)  $\mu$ , and spherical, hyaline or pale yellowish-brown, intercalary or less frequently terminal chlamydospores, 15.5 to 31 (23.4 by 20.5)  $\mu$ . Oospores did not develop. The fungus was grown in paired culture with two strains of *Phytophthora* from areca palm [*R.A.M.*, xxi, p. 165]; one of the dual cultures formed spherical, yellowish oospores, 15.5 to 24.8 (20)  $\mu$  in diameter. The tomato strain closely resembles one isolated by Uppal and Desai from areca palm (Nilekani strain) in 1939 [*ibid.*, xviii, p. 518] and is also similar to Butler's South Kanara areca strain of *P. palmivora* [cf. *ibid.*, xvii, p. 589]. A more detailed study of all the South Indian isolates of *Phytophthora* and others procured from different sources is in progress.

Positive results were given by inoculation experiments on growing and detached fruits, which rotted completely in five to six days, the same fungus being recovered from the diseased tissues. Entry was shown to take place through the unwounded surface of any part of the fruit. Young branches and leaves also reacted to inoculation by the development of a blackish-green, wet rot, the decayed portions falling off or the stem breaking at the site of infection, the further spread of which is arrested by the severance of the diseased material.

It is recommended that tomato plants should be staked or tied to frames to prevent contact with the soil and sprayed with Bordeaux mixture.

**ABERDEEN (J. E. C.). Experiments in the control of bacterial wilt of Tomatoes in south-eastern Queensland.**—*Qd agric. J.*, iii, 2, pp. 87–91, 1946.

During experiments from 1938 to 1940 on the control of bacterial wilt of tomato, *Xanthomonas solanacearum* [*R.A.M.*, xxiv, p. 478; xxv, p. 102], soil treatments described by Eddins [*ibid.*, xviii, p. 473] were used. Sulphur applied in autumn to produce a pH value of 4 and lime added in mid-summer to restore the value to 5 failed to control the wilt. In varietal trials for resistance Break o'Day proved very susceptible but strains of the Australian variety Sensation and Marvel from the United States showed signs of resistance, although the first-named is not good commercially. Louisiana Pink No. 1 and Carolina Cross No. 2, both selected for resistance in North Carolina, gave good results but must be improved.

**YOUNG (P. A.). Cuticle cracks in Tomato fruits.**—*Phytopathology*, xxxvii, 2, pp. 143–144, 1 fig., 1 diag., 1947.

During the week of 25th June to 1st July, 1945, Texas farmers lost the No. 1 grade price on many car-loads of green-wrap tomatoes from cracking of the cuticle of the tops within 2 cm. of the pedicels. The abnormality was closely correlated with a total rainfall of 1.38 in. on 22nd and 23rd June, followed by a temperature of 90° to 92° F. during the next three days. For the first day or two the cracks remained hyaline, but with the desiccation of the epidermal cells they turned black or brown, and within five days sunken, black spots, 3 to 12 mm. in diameter, had developed over the affected areas. Similar but fewer cracks were formed in green and red fruits between 11th and 21st November of the same year at a temperature

range of  $45^{\circ}$  to  $80^{\circ}$ ; during this period there was only 0.1 in. rain on five days, but the soil contained sufficient water from the 1.96 in. on the 9th and 10th. Microscopic examination of water mounts of the epidermis from affected fruits showed the cuticle cracks (most of which were short arcs of circles disposed concentrically round the pedicel) to range from 25 to  $3,000\mu$  by 12 to  $45\mu$ , lying 100 to  $300\mu$  apart, while the perpendicular fissures in some of the cracks measured 24 by  $2\mu$  and were situated 3 to  $6\mu$  apart in the longest one observed.

In 1946 the disorder assumed a milder form as compared with 1945, probably owing to the cooler conditions.

The cuticle crack herein described was more severe in varieties with dark-green stem ends (conferred by UU genes) in immature fruits, those of a uniform whitish-green colour at the corresponding stage (uu genes) being less susceptible: three selections of the latter type, including Crack-Proof, were also resistant to stem-cracking. Both forms frequently occur in the same fruits and probably originate in the uneven growth resulting from an unbalanced water supply. The subcuticular stem or growth cracks were 1 to 6 cm. long and 1 to 5 mm. deep and sometimes crossed the blossom end of the fruits, especially in the Trip-L-Crop variety; in Rutgers and Marglobe they were usually radial and in Louisiana Red concentric.

KUHNHOLTZ-LORDAT (M.). **Considérations générales sur le dépérissement des Châtaigneraies cévenoles et suggestions d'ordre pratique qui peuvent en découler.** [General considerations on the decline of the Chestnut groves in the Cevennes and practical suggestions that can result from them.]—*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 25–53, 9 fig., 1944. [Received February, 1947.]

In this paper (based on a lecture delivered to chestnut-growers in Gard, France, on 6th August, 1942) the author states that he has attempted to recapitulate all that is known about the chestnut wilt disease, associated in the Cevennes with *Phytophthora cambivora*, *Armillaria mellea*, and, possibly, insect attack [*R.A.M.*, xxiv, p. 436], and its control. The primary symptoms are chlorosis, non-setting of the fruit, and 'floc' or 'fire', which is a form of leaf-withering. The secondary symptoms consist of death of the top of the tree followed by ink disease, with black 'sweating' at the base of the trunk. Similar symptoms due to other causes are also described. Prophylaxis in relation to cultural practices and varietal resistance is discussed, and suggestions are made for an immediate campaign against the disease. The lines on which further study should proceed are indicated.

POPE (S. A.). **Some studies on the Dutch Elm disease and the causal organism.**—*Abstr. Thes. Cornell Univ.*, pp. 347–348, 1944. [Received April, 1947.]

Although the majority of authors in this field seem to think that wilting is primarily due to toxic materials produced by the infecting organism, this does not appear to apply to the Dutch elm disease [*Ceratostomella ulmi*; *R.A.M.*, xxv, p. 86; xxvi, p. 45], since toxic materials taken from various extracts and introduced into trees growing in pots did not cause wilting, although xylem tissue discoloration was noticed. The extracts themselves, however, did produce wilting in healthy elm cuttings as did various yeast fractions and extract in which the fungus had grown. Two of four fractions from each solution had toxic properties and since these were not derived by the same chemical treatment *C. ulmi* is believed to be able to produce more than one substance toxic to elm cuttings.

The action of toxic materials produced by the growth of the fungus seems to centre round the fungus itself, no discoloration appearing in advance of the pathogen, but although tissue discoloration may appear subsequently there is no outward visible symptom. The parenchymatous cells survived when over four

cells distant from the fungus mycelium, injury being caused by the formation of tyloses and gum in the vessels bordering these cells soon after the appearance of the fungus in the area. The toxic materials are produced too slowly by the fungus to cause any visible injury far ahead of it.

The daily water loss from healthy and inoculated *Ulmus americana* and *U. pumila* indicated that wilting was due to interference in the flow of water to the leaves; the stomata showed no signs of injury, wilting leaves recovering when removed from the diseased tree. The increased resistance of the American elm when inoculated after the formation of the summer wood is due to the arrangement of the vessels, the fungus being unable to spread through a sufficiently large area of xylem to cause serious wilt by extensive plugging of the vessels.

Mineral tests [ibid., xiii, p. 733] showed that potassium, phosphorus, and sulphur were necessary for the growth of *C. ulmi*. Pyridoxine ( $B_6$ ) was the only vitamin shown to be essential. The growth of the fungus is improved by a combination of amino acids with salts, sugar, and pyridoxine. The addition of rice bran extract and of glutathione to this medium brought the growth of the fungus to nearly normal. Potato dextrose agar was the best medium for cultures.

RHOADS (A. S.) & WRIGHT (E.). **Fomes annosus commonly a wound pathogen rather than a root parasite of Western Hemlock in western Oregon and Washington.**—*J. For.*, xliv, 12, pp. 1091–1092, 1946.

In a recent study of 600 scars (mostly inflicted from 5 to 32 years ago), 36 sunscald lesions, and 37 broken tips on 198 western hemlocks (*Tsuga heterophylla*) in western Oregon and Washington, *Fomes annosus* [*R.A.M.*, xxii, p. 231] was found in connexion with 119 of the 296 scars showing decay, in five sunscald lesions, and in three broken tops, the corresponding numbers of isolations from these sources being 95, 4, and 3, respectively. The volume of decay due to the pathogen exceeded that of all other fungi combined, amounting to 6.9 per cent. of a total gross volume of 28,848 cu. ft. and 6.5 per cent. of a total commercial volume of 26,978 cu. ft. *F. annosus* accounted for 55.3 per cent. of a total gross decay volume of 3,580 cu. ft. and 54.9 per cent. of a total commercial decay volume of 3,189 cu. ft. The same organism was isolated only once from 104 scars, one sunscald lesion, and four broken tops in 36 Sitka spruce (*Picea sitchensis*) trees dissected.

PETTIFOR (C. B.) & FINDLAY (W. P. K.). **Effect of sap-stain on the tensile strength of Corsican Pine sapwood.**—*Forestry*, xx, pp. 57–61, 1 fig., 1947.

In further studies of the effect of sap-stain on timber [cf. *R.A.M.*, xix, p. 180] the results were identical with those previously obtained. In these tests pieces of Corsican pine (*Pinus nigra* var. *calabrica*) sapwood 12 by  $\frac{1}{4}$  by 1 in. inoculated with *Ceratostomella caerulea*, *C. pilifera*, or *Diplodia natalensis* were used. After 64 days' incubation the losses in tensile strength from *C. caerulea* and *C. pilifera* were 5.8 and 5.6 per cent., respectively, but were not significant, and from *D. natalensis* [cf. ibid., xix, p. 379] 17.1 per cent. After 94 days' exposure the losses were 11.4, 11.5, and 14.1 per cent. respectively, with a loss of 12 per cent. in unsterilized pieces from general infection after 96 days.

As in the previous tests, blue stain had no appreciable effect on the compressive or the bending strength but caused a marked reduction in toughness which involves the tensile strength.

BJÖRKMAN (E.). **Om uppkomsten av stockblånad och lagringsröta i Furusågtimmer i samband med flottning.** [On the development of log blue stain and storage rot in Pine sawing timber in connexion with floating.]—*Medd. SkogsforskInst., Stockh.*, xxxv, 5, pp. 1–56, 6 figs., 17 graphs, 1947. [English summary.]

The following are some of the most important results of experiments carried out

in north Sweden in 1944-5 to determine the extent of fungal damage in pine sawing timber stored for varying periods in flowing and still water and on land after complete, 'spot' (partial), or no decortication [cf. *R.A.M.*, xxvi, p. 88]. The unbarked logs, in comparison with the wholly decorticated, sustained relatively little injury from cracks, blue stain (commonly associated with *Cladosporium herbarum*, *Pullularia pullulans*, and *Phialophora fastigiata*: [ibid., xxv, p. 373, and next abstract]), and storage rot (predominantly, and in most cases exclusively, due to *Stereum sanguinolentum*). The peeled timber stored on land until 1st July suffered considerably more damage than that kept at the landing only until 1st June and then floated, while the maximum of blue stain and storage rot occurred in logs left in still water, the incidence of infection increasing progressively with the prolongation of the storage period. Decay fell to a minimum in the timber stored in flowing water and continuously washed over by a strong current. Fungal damage to logs sawn on 1st July was inconsiderable and consisted almost entirely of blue stain, which had become more prevalent by 1st August; storage decay did not appear before 1st September.

Since wholly decorticated timber invariably develops blue stain and later storage rot during the floating process, logs stripped of their bark to promote buoyancy should arrive not later than 1st August at the sawmill, where they should either be sawn immediately or protected from fungal invasion by means of a water spray or submersion in large piles. 'Spot'-barking for the enhancement of buoyancy may be practised with advantage in normal floating procedure (immersion not later than 1st June and kept in water until 1st November). Land storage for periods up to one month during the floating season results in only slight damage. The bark should not be removed from wood that floats sufficiently well without recourse to this practice, or where the logs can be immersed before June.

**BJÖRKMAN (E.). Om betingelserna för uppkomsten av brädgårdsblånad samt dennas bekämpande.** [On the conditions for the development of timber-yard blue stain and on its control.]-*Medd. SkogsforskInst., Stockh.*, xxv, 7, pp. 1-46, 7 figs., 1 diag., 4 graphs, 1947. [English summary.]

Besides *Pullularia pullulans*, *Cladosporium herbarum*, and *Phialophora fastigiata*, the most widespread agents of blue stain in Swedish timber yards [see preceding abstract], many other species were encountered in the writer's investigations, including *Ophiostoma* [*Ceratostomella*] *piceae*, *O. [C.] pini* [*R.A.M.*, xxiv, p. 392], *Trichosporium heteromorphum* [ibid., xxi, p. 58], at least three species of *Penicillium*, and *Trichoderma lignorum* [*T. viride*: ibid., xxii, p. 121], of which the last-named predominated as an agent of 'mould blue stain'. *Stereum sanguinolentum* [see preceding abstract] and *Peniophora gigantea* [ibid., xix, p. 685] were occasionally found causing storage rot of boards stacked for protracted periods and exposed to saturation by rain or snow.

The results of spore-trapping experiments in June, July, and August, 1943, involving the ten-minute exposure in different parts of the yards of Petri dishes containing malt agar, showed the blue-staining fungi to be practically ubiquitous, whereas in a comparable test on 14th May, 1946, their incidence was negligible. Hence the risk of atmospheric contamination during the period of prevalence of the organisms can only be eliminated by the provision of conditions adverse to their development. In experiments to determine the lower humidity limit for the growth of blue-staining fungi in wood [ibid., ix, pp. 77; x, p. 146; xviii, p. 360], no appreciable discoloration occurred where the final moisture content was below approximately 24 per cent. of the dry weight, while at 90 per cent. relative air humidity the incidence was considerably less (0,0,0,30, and 80 per cent. of the block surfaces on 24th June, 29th July, 26th August, 23rd September, and 21st October, respectively) than in a saturated atmosphere (5,5,40,60, and 100 per cent.,

respectively). Furthermore, wood absorbs moisture but slowly from the atmosphere, so that shipping-dry timber with a moisture content of 18 to 22 per cent., unless directly exposed to water, runs little risk of blue-stain infection even in saturated air. On the other hand, the discoloration developed at 90 per cent. relative air humidity in newly sawn, undried wood. The percentage incidence of *C. piceae* in the undried blocks at 90 and 100 per cent. relative air humidity was 20 and 100 for pine, and 5 and 100 for spruce, the corresponding figures for *Phialophora fastigiata* being 5 and 0, and 30 and 5, respectively. Neither fungus developed in the dry blocks. These data incidentally confirm the well-known superiority of spruce to pine timber in respect of resistance to blue stain. For this reason it is a common practice to saw pine in the spring and early summer when, as indicated above, there is little risk of blue stain, and to reserve the spruce for the late summer and autumn, when the prevailing temperatures coincide with the optimum (20° to 25° C.) for the development of the causal organisms.

Rational methods of piling the timber so as to allow free circulation of air through the stacks are described [ibid., xxvi, p. 88]. In oven-drying experiments, both 'full' (56 hours) and 'half' (28) drying afforded adequate protection against blue stain, but full drying is advisable during the period of maximum liability to the defect (July to September). In impregnation tests on pine boards the chlorophenol preparations, dowiecide and pentolat (the latter supplied by Uddeholms AB), there was a marked disparity between the 1944 and 1945 results. Whereas in the former year even the maximum concentration of 0.8 per cent. failed to prevent the development of blue stain from June to September, in the latter (an exceptionally dry season) no infection occurred in the boards treated with a 0.6 per cent. solution. There was little difference in efficiency between the two fungicides. In practice, a 0.8 per cent. solution should be safe in June and July, while the use of a higher strength (1 to 2 per cent.) is recommended for the critical period from August to October. All the impregnated boards in unroofed piles were found to have developed blue stain under the influence of moisture, demonstrating the need for protection even of treated material.

WILSON (J. D.). **Use of fixed coppers on vegetables.**—*Agric. Chemicals*, i, 8, pp. 32–34, 1946.

After referring to the injurious effects sometimes produced on plants by Bordeaux mixture [cf. *R.A.M.*, xxiv, pp. 221, 406; xxv, p. 268], the author states that the fixed coppers [ibid., xix, p. 507], designed to replace it on Bordeaux-sensitive hosts, fall into four groups: the oxychlorides, the basic sulphates, the oxides, and a miscellaneous group which includes a combination of an oxychloride and a sulphate (COCS) [ibid., xxiv, p. 396], as well as various other copper salts. The best known oxychlorides are copper A [ibid., xxiv, pp. 262, 396] and cupro K [ibid., xvi, p. 544]. Among the basic sulphates are such trade names as tribasic [ibid., xxiv, p. 209], basicop [ibid., xxiv, pp. 396, 477], and spraycop [ibid., xxii, pp. 221, 481]. Cuprocide [ibid., xv, p. 552; xxiv, p. 396, *et passim*] is the most widely used oxide. Other names include coposil [ibid., xiv, p. 591], copper hydro 40, copper zeolite [ibid., xv, p. 665], basic copper arsenate, brown cupric hydrate, and bordow [ibid., xxiii, pp. 70, 444].

In general, the fixed coppers are less effective in the control of disease than Bordeaux mixture, but even so the yields are not usually less. As a group they are less adhesive. In most cases, an equivalent amount of copper should be applied in the form of a fixed copper as is used in Bordeaux mixture, and applications should be made at the same intervals. In dust form, the fixed coppers should be used at the rate of at least 45 to 50 lb. per acre of a 7 per cent. dust.

Specific recommendations for the use of the fixed coppers against various vegetable diseases are listed. Basic sulphates give the best results for carrots and

*Cucurbita* spp. with tomatoes next. The oxychlorides, COCS, and cuproicide are effective for most vegetables, the first, however, may cause some injury to potatoes and carrots, and the last-named to potatoes and *Cucurbita* spp.

КОВАЧЕВСКИ (I. C.). Опити затретирание на зеленчукови семена с органически живачни препарати и меденкарбонат. [Experiments in vegetable seed treatment with organic mercurials and copper carbonate.]—*Bull. Chambre Cult. nat., Sofia*, Sér. Biol., &c., i, 1, pp. 87–129, 1946. [English summary.]

The writer describes and tabulates the results of experiments in vegetable seed disinfection in Bulgaria with some standard organic mercurial steeps and dusts and copper carbonate dust (20 per cent. copper content). Ceresan (U. 564) was the least injurious of the liquid preparations, one hour's immersion in a 0.25 per cent. concentration or half-an-hour at 0.5 per cent. being readily tolerated by most of the 14 kinds of seed used in the tests. It was followed by germisan (G. 3659 I-nass), which was also innocuous to most species under the same conditions. The third and fourth places were occupied by fusariol-neu (2115-a) and abavit-nass (3330-a), respectively.

Copper carbonate could be applied with complete safety, even in excess, both to dry and moist seed. Abavit-neu was also harmless, except to the May King lettuce variety. Germisan (G. 4096a-trocken) and U.T. ceresan (1875a) caused relatively little injury, but the use of fusariol and granosan dusts can only be recommended, on the basis of these tests, for very refractory infections against which milder treatments are unavailing.

Of the various species of vegetables tested, okra [*Hibiscus esculentus*] was the most tolerant of seed disinfection, followed by onion, while lettuce was more sensitive than any of the others. The maximum stand increases in response to seed treatment were secured with cucumbers, peas, and beans [*Phaseolus vulgaris*], while tomato, chilli, eggplant, *H. esculentus*, cabbage, spinach, and carrot also benefited significantly.

LHOSTE (L.). **Le pied noir de la Betterave.** [Black leg of Beet.]—*Rev. hort., Paris*, N.S., xxx, 14, p. 232, 1947.

Black leg of beet caused by *Phoma betae* [*R.A.M.*, xxv, pp. 26, 56], carried on the seed in pycnidia, is largely checked by seed disinfection, by steeping or, better still, dusting. Products such as ceresan (at 800 gm. per 100 kg. seed) are recommended by the Belgian Institute at Tirimont, and germex was found to be equally effective at the Gembloux Station. Treated seed should not be kept in stock for over a year.

VANDERWALLE (R.). **Observations et recherches effectuées a la Station de Phytopathologie de l'État pendant l'année 1942.** [Observations and researches carried out at the State Phytopathological Station during the year 1942.]—*Bull. Inst. agron. Gembloux*, xii, 1–4, pp. 97–109, 1943. [Received March, 1947.]

In this report, on the same lines as those for previous years [cf. *R.A.M.*, xxv, p. 152], it is stated that haricot beans [*Phaseolus vulgaris*] at Gembloux, Belgium, frequently showed the presence of K. M. Smith's *Phaseolus* viruses 1 and 2 [bean mosaic virus and bean yellow mosaic virus, respectively], concurrently on the same variety, while bean virus complexes were also prevalent. From a list compiled by the Agricultural Adviser for the province of Hainaut, showing the resistance of haricot bean varieties to virus diseases [unspecified], it appears that Beurré jaune, Beurrée doré nain, Saint-Esprit, and the high-yielding Métis and Supermétis are resistant. The Princesse à grain blanc variety shows marked symptoms of virus

attack: the leaves lose colour, the leaf blades are malformed and undulating, the sepals curl up, and the flowers fall. This variety should no longer be grown. A little-known variety which might, perhaps, replace it is *Saxa mange-tout*. *Jaune de Chine* and *Sabre à longues cosses* are moderately resistant, as is also *Conservado*, but its resistance is apt to become lowered on some soils. The *Flageolet* blancs and *Hâtif d'Étampes* are severely affected, though the *Flageolet* verts is more resistant than *Flageolet* blancs in good soil. *Nain noir de Belgique* shows slight symptoms on the foliage, while *Roi des Belges*, which is an improved type of this variety, is resistant, and should replace it. *Lingot*, highly resistant, is strongly recommended.

ZAUMEYER (W. J.) & HARTER (L. L.). **Pintos 5 and 14. New rust-resistant Beans for dryland areas of the west.**—*Sth. Seedsman*, ix, 8, pp. 15, 50, 54, 3 figs., 1946.

Two new Pinto beans [*Phaseolus vulgaris*], for the present named No. 5 and No. 14 Pinto, combining resistance to rust [*Uromyces appendiculatus*; cf. *R.A.M.*, xxii, p. 88] with tolerance of common [bean] mosaic virus [ibid., xxv, pp. 205, 484], and halo blight [*Pseudomonas medicaginis* var. *phaseolicola*; ibid., xxvi, p. 41], have been developed. These varieties should be released to growers by autumn, 1946. They were both derived from a cross between Idaho Pinto, an early, rust-susceptible type, and the resistant, white-seeded Kentucky Wonder. The new strains are primarily adapted to irrigation culture.

JAUCH (CLOTILDE). **Observaciones sobre infecciones naturales y artificiales de 'Pellicularia filamentosa' (= Corticium solani).** [Observations on natural and artificial infections with 'Pellicularia filamentosa' (= *Corticium solani*).]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, iii, 24, 7 pp., 4 figs., 1947.

In June, 1944, two- to three-month-old broad bean plants at a regional plant quarantine station in Argentina presented large, necrotic lesions along the stems and at their bases, to which they succumbed within a few weeks. Microscopic examination revealed invasion of all the underlying cells by a copious mycelium consisting of hyaline, later ochraceous-buff, septate hyphae, which was identified as that of *Pellicularia filamentosa* (*Corticium solani*) [*R.A.M.*, xxii, p. 372]. The same fungus developed in April, 1945, in eight isolations from chick pea [*Cicer arietinum*] seedlings showing dark, elongated, slightly sunken, basal lesions, two others yielding *Fusarium* sp. Basidia with sterigmata (6 to 13  $\mu$  in diameter) and basidiospores (8 to 13 by 4 to 7  $\mu$ ) arose from the mycelium covering the soil in pot inoculation experiments with isolates of the fungus from the two above-mentioned hosts, pine, and *Iberis*.

The production of the fructifications was expedited under humid conditions at a temperature range of 20° to 25° C. Their formation on the soil itself, besides explaining the wide diffusion of the pathogen, emphasizes the need for stringent precautions to obviate confusion between natural and artificial infection in inoculation experiments.

CAMPACCI (C. A.). **Podridão branca do Alho e da Cebola.** [White rot of Garlic and Onion.]—*Biológico*, xii, 12, pp. 279–281, 1 pl., 1 fig., 1946.

Besides rust (*Puccinia allii*), a disease of major importance on garlic, onions, and other species of *Allium* in São Paulo, Brazil, white rot (*Sclerotium cepivorum*) has been assuming a serious character in the State since 1942 [cf. *R.A.M.*, xxiii, p. 509], when it was first observed on a consignment of garlic from France. The symptoms of the latter disease are briefly described, and recommendations made for its control: by seed selection; the destruction of infected crop refuse by burning *in situ*; crop rotation, allowing an interval of eight to ten years between one garlic

or onion crop and the next; elimination of primary foci of infection by the eradication and burning of diseased stems as soon as they appear; and avoidance as planting sites of very compact soils liable to waterlogging.

CANNON (O. S.). **Fusarium wilt of Spinach.**—*Abstr. Thes. Cornell Univ.*, pp. 327-329, 1944. [Received April, 1947.]

This disease has been reported in several States since 1919 when it was first discovered and the causal fungus named *Fusarium spinaciae* [*R.A.M.*, vi, p. 140]. Annual losses of 5, 3, and 5 to 20 per cent. have been reported for Maryland, Virginia, and Nassau County, New York, respectively. The above-ground symptoms for the young plant are wilting and death while stunting and yellowing precede the wilt on the older specimens. There is a brown discoloration of the tap root, fibrous rootlets, and often the stele, accompanied by reduction in size and number of the rootlets; dark brown to black lesions on infected roots in the field are due to secondary invaders. Spinach wilt is caused by *F. oxysporum* f. *spinaciae* (Sharp) Snyder and Hansen [*ibid.*, xix, p. 495]. Other *F. sp.* of the *Elegans* and *Martiella* sections associated with wilt are found to be only secondary invaders. The pathogen, carried on or in the seed coat, can penetrate uninjured spinach roots and grows mainly in the vascular tissues of the root and hypocotyl. It is far more destructive after having already multiplied in the soil and can live there for many years. Different isolates of the pathogen differ in pathogenicity. Spinach alone of common vegetables is susceptible to the disease. The pathogen grows at from 6° C. to above 33°, best growth occurring at 27° and the optimum pH on buffered agar medium being 5. Spinach was found to survive in previously manured soil while plants died in the same ground without manure; its survival also increased with the added alkalinity of the soil. Sodium nitrite applied at 1,000 lb. per acre reduced wilt and also chloropicrin applied eight days before planting. None of the 126 varieties tested proved resistant but it is thought that resistant varieties of commercial value could be developed. Spinach should not be planted in infested soil during June, July, or August; the pH should be kept neutral with much organic matter incorporated in the soil to reduce risk of infection. If the pathogen is not yet present it can be avoided by rotation.

Seedlings suffering from a dark brown root rot harboured a *F. sp.* differing in morphology and pathogenicity from the wilt pathogen [*ibid.*, xxv, p. 128].

REICHERT (L.), PALTÍ (J.), MOELLER (S.), HOCHBERG (N.), AVNI (J.), & SAFRAN (B.). **Trials for the control of powdery mildew on wine and dessert Grapes in 1943-1945.**—*Bull. Rehovoth agric. Res. Sta.* 38, 20 pp., 1946. [Hebrew, with abbreviated English translation.]

In 11 further experiments from 1943 to 1945 on the control of vine powdery mildew (*Oidium tuckeri*) [*Uncinula necator*] in three localities in the coastal belt of Palestine [*R.A.M.*, xxiii, p. 427], yellow ground sulphur dust proved generally more reliable than the four sprays tested, namely, the sulfinette and cita brands of lime-sulphur, the dispersible spersul, and the cuprous oxide perenox. The admixture of 30 per cent. lime dust with the sulphur did not impair the efficacy of the latter, which was reduced, however, by a higher proportion (50 per cent.). On the Carignan (wine) variety the first application of sulphur could safely be postponed until the time of flowering, even if foliar symptoms had already appeared. When the first dusting of the Madeleine and Chassas dessert varieties was carried out one to six days after the development of infection on the leaves, the results were equal to those secured by prophylactic treatments. Effective control was given by dusting at 12- to 14-day intervals even under conditions of very severe infection. The schedule resulted in very high percentages of marketable dessert fruit and greatly increased the weight of wine grapes.

Bosc (M.). **Sur la dégénérescence des noyaux et des chloroplastes des cellules de feuilles de Vigne parasitées par *Plasmopara viticola* (Berk. et Curt.) Berl. et de Toni.** [On the degeneration of the nuclei and chloroplasts of Vine leaf cells parasitized by *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni.]—*C.R. Soc. Biol., Paris*, cxl, 21–22, pp. 834–836, 12 figs., 1946.

Continuing his studies on the cytology of *Plasmopara viticola* in vine leaves [*R.A.M.*, xxvi, p. 283], the author found that the process of nuclear degeneration is accompanied by a progressive reduction in the size of the chromocentres and a disappearance of the chromatin and ultimately of the amorphous nucleus itself. The dissociation of the lipoprotein complexes of the chloroplasts culminates in the fatty degeneration of the latter. There was no trace of the lipoids in severely infected cells, presumably owing to their assimilation by the fungus or obliteration through chemical transformation.

MARTINOFF (S. I.). Борбата съ пепелницата ***Uncinula necator* (Schw.) Burr. (*Oidium tuckeri* Berk.)** по Лозата. [Control of powdery mildew *Uncinula necator* (Schw.) Burr. (*Oidium tuckeri* Berk.) on the Vine.]—Plant Protection Institute, Sofia, 67 pp., 2 diags., 1940. [English summary. Received January, 1947.]

Further experiments were carried out near Varna, Bulgaria, in 1938, to determine the relative efficiency of various sulphur-containing dusts and sprays in the control of vine powdery mildew (*Uncinula necator*) [*R.A.M.*, xvii, p. 726], the schedule comprising four treatments (1) 26th and 27th May, (2) 15th and 16th June, (3) 6th and 7th July, and (4) 29th and 30th July. Sulphur saim (an Italian product derived from ground sulphur ore) and pure sulphur dust gave perfect control, as also did spraying with wetted pure sulphur (1 kg. per 100 l. water plus 2.5 l. resin soap or 8 to 10 beaten eggs) or lime-sulphur (1 in 120 or 1 in 160) with the addition of resin soap. Without an adhesive lime-sulphur reduced the incidence of infection from 23.5 to 2 per cent. The admixture of resin soap with the lime-sulphur resulted in a discoloration of the grapes, unfitting them for the table. Plodorod wettable sulphur (0.5 per cent.) and serol (a paste of sulphur powder and casein) at 1 per cent. were about equally effective with pure lime-sulphur. Sulphur saim, pure sulphur dust, and pure lime-sulphur caused slight blotching of the foliage and fruit, probably due to acidity, which was neutralized by the resin soap and egg adhesives.

MCKINNEY (H. H.). **Stability of labile viruses in desiccated tissue.**—*Phytopathology*, xxxvii, 2, pp. 139–142, 1947.

The viruses of cucumber mosaic, southern celery mosaic [? a strain of cucumber mosaic], tobacco ring spot, potato 'Y' mosaic [potato virus Y], tobacco etch, lucerne mosaic, apical and eyespot mosaics of oats [*R.A.M.*, xxv, p. 554], wheat mosaic rosette, and prairie wheat yellow mosaic [*ibid.*, xxiv, p. 136] are inactivated in a short time (within a few weeks at most) when leaves containing them are dried in the ordinary way in the laboratory. However, when leaves, cut into small pieces are desiccated rapidly over calcium chloride crystals at 1° to 2° C. and then stored in moisture-tight bottles at the same temperature, all except the oats eyespot mosaic virus survived for relatively lengthy periods. The cucumber mosaic virus in maize, for instance, persisted for 669 days, the corresponding periods for southern celery mosaic in maize, tobacco ring spot in tobacco, lucerne mosaic in cucumber, one sample of potato virus Y in tobacco, and tobacco etch in tobacco being 613, 393, 303, 420, and 301, respectively. Another sample of potato virus Y in tobacco persisted for only 78 days, the two wheat mosaic viruses in wheat for 290, and apical mosaic of oats in oats for 177. The cucumber mosaic virus in maize also

survived drying in the oven at 35° for 20 hours and storage over calcium chloride at 23° for periods up to 58 days, and the southern celery mosaic virus in maize withstood drying over calcium chloride in the oven at 35° for 18 hours and storage at 1° to 2° for 27 days.

On the basis of these data the author concludes that the comparatively rapid inactivation of the labile viruses dried at room temperature is not entirely attributable to oxidation or desiccation, other factors, such as fermentation processes, probably being more directly concerned.

The major importance of the host species appears from incidental tests to lie in its capacity for production of a large quantity of virus rather than in any influence it may exert on the survival in the dried material.

BARTHELET (J.) & VINOT (M.). **Notes sur les maladies des cultures méridionales.**

[Notes on the diseases of plants grown in the south of France.]—*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 11–23, 6 figs., 1944. [Received February, 1947.]

In these notes on plant diseases observed in the south of France [cf. *R.A.M.*, xxvi, p. 216] the authors state that fig trees growing on alluvial soil in the Vallée du Gapeau, Var, are sometimes killed off by root rot generally due to *Armillaria mellea*. Wilt of the same host after frost damage is caused by *Fusarium lateritium* [*Gibberella lateritia*]. Old fig trees show cankers produced by *Phomopsis cinerescens* [ibid., xxiii, p. 33]. On fig leaves two fungi were constantly found in Var and the Alpes-Maritimes, one causing rust (*Kuehneola* [*Cerotelium*] *fici*) [ibid., xxi, p. 99; xxv, p. 475], the other, *Cercospora bolleana* [ibid., xxi, p. 350], causing leaf spot. The latter is common in the Mediterranean area, but does not appear to have been described before for France. It appears from July onwards on the lower leaves and frequently in great abundance on the suckers. Affected leaves show quadrangular, greenish-brown, later darker spots, often confluent, bounded by the secondary veins, on the lower surface, and later brown necrotic spots on the upper surface. The first lesions develop near the main veins. The damage caused is not great and no treatment is necessary.

In the winter of 1942–3 *Foeniculum dulce* [*F. vulgare*] was widely attacked by *Fusicladium depressum* [ibid., ix, p. 613], which caused heavy loss in some plantings. Scattered patches of plants turned yellow and developed leaf wilt. The leaflets dried up, and later on the petioles softened and withered. The resulting growth disturbance caused desiccation of the entire bulbous part of the petioles or arrest of the thickening of these organs. The affected leaflets and petioles showed the presence of numerous brown areas, which on the latter were up to 7 mm. long by 2 mm. wide. The conidiophores measured 50 to 60 by 6 to 7  $\mu$  (100 to 120  $\mu$  long on old fructifications), while the hyaline, irregular, 2-celled conidia averaged 40 to 45 (occasionally up to 60) by 6 to 7  $\mu$ ; they were often constricted in the middle.

Every year carrot plantings in the south of France show serious withering of the foliage in autumn, following on the rains that come at the end of September. Entire plots appear as if scorched. The condition is most common in damp places under trees. The petioles and leaflets show numerous ocellate spots, 1 to 4 mm. in diameter with a white centre and a brown, diffuse halo; when very many are present, they act like an annular incision and induce sudden desiccation of the whole leaf. The disease is little known in other parts of France. It would appear to resemble the disease described by Kühn in Germany in 1852, and the causal organism is considered to be identical with that described by him as *Alternaria brassicae* var. *dauci*.

In May, 1940, branches of cypress (*Cupressus macrocarpa*) were received from La Nartelle, Var, bearing large cankers 20 to 30 cm. long. The condition was associated with a fungus agreeing with the description of *Coryneum cardinale* [ibid., xxiv, p. 39].

In June, 1939, a 15-year-old *Phoenix canariensis* tree at Nice showed complete rotting of the terminal bud and bases of the rachids of the adjacent leaves as a result of infection by *Thielaviopsis* [*Ceratostomella*] *paradoxa*. The fungus does not appear to have been recorded previously in France on a living host, and is presumed to have come from North Africa [cf. *ibid.*, xi, p. 510; xiv, p. 429].

KUHNHOLTZ-LORDAT (M.). **Notes de pathologie végétale (suite).** [Notes on plant pathology (continuation).—*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 55–63, 11 figs., 1944. [Received February, 1947.]

In these further notes [cf. *R.A.M.*, xxv, p. 381] the author states that horse-chestnut (*Aesculus hippocastanum*) is sometimes affected by a very serious disease of the leaves caused by different species of *Septoria* in different localities. Those found in Europe are *Septoria aesculi* ([spores] 4–5-celled, 50 to 60 by 3 to 3.5  $\mu$ ), *S. hippocastani* (1-celled, 55 to 60 by 2.5  $\mu$ ), *S. aesculina* (1-celled, 36 to 44 by 3.5 to 5  $\mu$ ), and *S. aesculicola* (1-celled, 20 to 30 by 1  $\mu$ ). In September, 1941, a *Septoria* was found in Lozère (Notre-Dame des Neiges) which did not agree exactly with any of these. The spots were sparse and 2 to 3 mm. in diameter. On the lower surface they were ochraceous with a purplish-brown border. On the upper surface the centre, at first ochre, turned white, and was surrounded by a broad, dark-purple band. A small, black pycnidium (occasionally two) occupied the centre, and its hypophyllous pore emitted in an agglutinated cordon 3-septate, arcuate stylospores, 48 to 54 by 1.6 to 2  $\mu$ . The author considers that this form should be referred to *S. aesculi*, which should include a form *major* (*S. aesculi sensu stricto*) and a form *minor*, which is this one from Notre Dame des Neiges.

When the warm, wet winds blow across Languedoc from the Mediterranean, sunflower inflorescences sometimes become infected by *Cladosporium herbarum*. If this occurs during flowering it can impede reproduction, the fungus showing marked predilection for the pollen, which it turns into black clots. This is of frequent occurrence in September, though the seed does not appear to sustain any injury.

Opaque, black teleutospores of certain rusts can be cleared by using Gastaud's mixture [*ibid.*, xxv, p. 381]. They are placed in a drop of lactic acid, and the mixture is added at the edge of the slide; it rapidly diffuses and the teleutospores turn a very clear reddish-brown.

#### **Annual Report of the Science Service, Dominion Department of Agriculture, for the year ended March 31st, 1946.**—88 pp., 1946.

The following items are of interest in the Plant Pathology section (pp. 35–40) of this Canadian report [cf. *R.A.M.*, xxiv, p. 491].

At the end of the war many more shipments of nursery stock were intercepted because of disease. No new or rare diseases were found but among seriously diseased shipments were *Narcissus* [bulbs] with 70 per cent. basal rot [*Fusarium bulbigenum*: *ibid.*, xxiii, p. 133] and hyacinths with 80 per cent. yellows (*Xanthomonas hyacinthi*: *ibid.*, xvi, p. 319), both from Holland, and tomato seedlings from the United States with high percentages of bacterial spot [*Xanthomonas vesicatoria*: *ibid.*, xxiv, p. 252].

Studies were continued in Ottawa to determine the prevalence and importance of seed-borne diseases [*ibid.*, xxv, p. 590]. Representative seed samples were examined from 1,145 seed stocks consisting of 595 samples of peas, 195 of flax, 31 of swedes, 9 of tobacco, 200 of vegetables, and 51 of clover and grasses. Each sample was certificated as being (a) suited for seeding purposes, (b) suitable if seed-treated, or (c) unsuitable for seeding purposes. Specific treatments were recommended where necessary.

As the result of a regulation requiring that foundation and elite seed stocks be inspected, passed by the Canadian Seed Growers' Association, 127 crops around

Ottawa and two at Kapus-Kasing were inspected by a plant pathologist. Pea seed heavily infected with *Ascochyta pisi* [ibid., xxvi, p. 91] treated with 1 per cent. ceresan, spergon, or arasan gave considerably higher emergence and pod yield than the untreated, the figures being doubled in the case of spergon and arasan. In attempts to find a relationship between laboratory test data and field incidence for *A. pisi* and *A. [Mycosphaerella] pinodes* it was found that *A. pisi* had a higher field disease rating with increasing seed infection. No such correlation was evident with *M. pinodes* in any of the 76 seed samples used.

In 1945 an intensive scouting campaign was launched by the Dominion Department of Agriculture in Quebec, Ontario, New Brunswick, and Nova Scotia against the Dutch elm disease (*Ceratostomella ulmi*) [ibid., xxvi, p. 9]. Quebec seemed to have the only infected area, which extended from Quebec City to Lachine and from Richmond to St. Gabriel, an area of 160 miles long by 80 miles at its maximum width. The centre of infection seemed to be Sorel [ibid., xxv, p. 61], where the disease had probably been present for as long as ten years. A total of 1,349 infected trees have so far been found. The vector *Hylurgopinus rufipes*, the native elm-bark beetle, is not supposed to be as effective a carrier as the European bark beetle [*Scolytus scolytus*], but it is doubtful whether this is so in Quebec in view of the widespread occurrence of *C. ulmi* there although only the native beetle occurs. As a measure against the spread of the disease all infected trees were destroyed [ibid., xxii, p. 504], but the results can only be assessed by studying the continued spread of the disease.

In the collection of wood-destroying fungus cultures there are 1,181 named cultures representing 321 species of 57 genera.

**BRIEN (R. M.). Second supplement to 'A list of plant diseases recorded in New Zealand'.**—*N.Z. J. Sci. Tech.*, A, xxviii, 3, pp. 221–224, 1946.

This is a list of 54 diseases of fungal, bacterial, virus, and physiological origin on 56 hosts. The records are either of new diseases or additional hosts since the publication of original list (1939) and the first supplement (1942) [*R.A.M.*, xxiii, p. 79]. Mention may be made of *Peronospora antirrhini* on *Antirrhinum majus* [ibid., xxvi, p. 130], *Cylindrosporium concentricum* on cabbage, *Erysiphe cichoracearum* on vegetable marrow, and *Pestalotia guepini* [ibid., xxii, p. 482] on *Camellia japonica*, all new to the country, and of the following additional hosts: *Atropa belladonna* for *Verticillium albo-atrum*, grapefruit for *Phytophthora citrophthora*, vegetable marrow for *Mycosphaerella citrullina* [ibid., xix, p. 66; xxv, p. 23], *Cyphomandra betacea* for *Glomerella cingulata*, *Dipsacus fullonum*, *Gerbera* sp., and *Hyoscyamus niger* for *Sclerotinia sclerotiorum*, loquat for *Fabraea maculata*, *Escallonia macrantha* for *Stereum purpureum*, flax for *Botrytis cinerea*, and apricot for *V. dahliae*.

**New plant diseases.**—*Agric. Gaz. N.S.W.*, lviii, 2, p. 94, 1947.

The following were recorded for the first time in New South Wales during the year ended 31st December, 1946: crown rot (*Rhizoctonia* [*Corticium*] *solani*) on celery, *Sclerotinia* stem rot (*S. sclerotiorum*) on sweet pea, American common blight (*Xanthomonas phaseoli* var. *fuscans*) on French bean (*Phaseolus vulgaris*), *Entyloma physalidis* on Cape gooseberry (*Physalis peruviana*), and die-back and canker (*Cytospora* [*Valsa*] *chrysosperma*) on Carolina poplar (*Populus deltoides*) [*R.A.M.*, xix, p. 623].

**LECKIE (W. G.). Basutoland. Annual Report of the Department of Agriculture for the year ended 30th September, 1946.**—28 pp. [? 1947.]

In this report it is stated that all wheat seed issued by the Department of Agriculture (over 3,000 bags in 1945–6) is treated with copper carbonate against

smut [? bunt: *Tilletia caries* and *T. foetens*: cf. *R.A.M.*, x, p. 679]. Grain visibly infected is not permitted to be sold. As a result of these measures bunt has been very light in recent years.

WATERSTON (J. M.). **Report of the Plant Pathologist, 1946.**—Department of Agriculture, Bermuda, 18 pp., 4 figs., 2 maps, 1947.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xxvi, p. 96]. Within the limits of a late-season test, Dupont sulfuron wettable sulphur, 8 lb. in 100 gals. water, proved more effective than 2 lb. fermate plus 5 fl. oz. Dupont spreader-sticker in 100 gals. in the control of fig rust (*Cerotelium fici*) [ibid., xx, p. 124, and above, p. 328]. New hosts of *Sclerotinia sclerotiorum* recorded during the year were aster, papaw, periwinkle (*Catharanthus roseus*) [*Vinca rosea*], *Iberis umbellata*, and *Petunia hybrida*. A species of *Oidium* was found on *Linaria vulgaris* and *Puccinia coronata* on *Lolium multiflorum*, both for the first time in Bermuda.

DYER (R. A.). **Protection and classification of plants.**—*Fmg S. Afr.*, xxii, 251, pp. 269–273, 1947.

The following items are reported in the plant pathology section of the Annual Report of the Department of Agriculture for the year ended 31st August, 1946 [cf. *R.A.M.*, xxiv, p. 402]. The production of virus-free potato 'seed' at the Riet River Settlement [ibid., xxiv, p. 384] was cut to 2,000 bags, sufficient for the settlers who took over the land at the end of the summer. Previously, seed potatoes have been cultivated in areas relatively free from aphids carrying virus diseases. Now, however, owing to shortage of such land an attempt is being made to produce vigorous 'seed' stocks in areas where some aphids are found.

Bacterial wilt of tomato and eggplant [*Xanthomonas solanacearum*: ibid., xxv, p. 536] is still prevalent. The resistant strains of eggplant distributed from the Botanic Station, Durban, are very popular and satisfactory but so far no resistant tomato variety has been found.

Spraying or dusting mangoes with 50 : 50 sulphur-copper mixture effectively controls *Erysiphe cichoracearum*, anthracnose [*Gloeosporium mangiferae*: ibid., xxii, p. 215], and a new inflorescence blight, caused by *Physalospora perseae*, which is very destructive in the Eastern Transvaal.

In 1946, young wheat plants were commonly attacked by orange leaf [brown] rust (*Puccinia triticina*) and mildew (*Erysiphe graminis*). Root rot due to *Helminthosporium sativum* was more prevalent, but the affected plants were stunted and this stunting was later found to be due to the maize streak virus [ibid., xxvi, p. 194]. This disease occurs throughout the Transvaal wheat areas and is its most important disease. Maize streak, although prevalent in late summer, was absent in early plantings probably because of the prolonged drought or the severe winter of 1945. This virus was shown to infect wheat, barley, rye, and oats. The small grains are probably instrumental in carrying the infection from one crop to another. No South African maize varieties are immune from the disease and all those from the United States are highly susceptible. One variety of *Euchlaena mexicana* and one of *E. perennis* proved immune and may provide a breeding basis for resistant varieties. A few Canadian wheat varieties are resistant.

An ear rot of maize new for South Africa caused by *Basisporium gallarum* [*Nigrospora oyzae*] is reported. The damp weather favoured damage from the ear rot due to *Gibberella fujikuroi* [ibid., xxii, p. 475].

The damage from loose smut of oats (*Ustilago avenae*) varied from 30 to 80 per cent., and was caused by insufficient seed disinfection. Losses from covered smut of barley (*U. hordei*) never exceeded 5 per cent.

There has been another outbreak of potato wart disease (*Synchytrium endobioticum*) at Volksrust, Wakkerstroom, and Charlestown, indicating that the disease has not yet been eradicated as had been hoped [ibid., xxiv, p. 402]. Quarantine measures have been applied. Sugar-cane mosaic disease [ibid., xxvi, p. 30] has also occurred again recently but in mild form on Co. 281 and Co. 301 with patches of high infestation on a few estates. When the sugar industry switched from the mosaic-immune Uba variety to the resistant Co. types a few years ago it was believed that all remaining susceptible varieties were destroyed. It is now evident that a source of infection remained probably in native grasses (*Setaria* sp.) and spread from there to the cane fields.

Owing to the presence of stem-pitting, a disease of obscure origin believed to be transmitted by budding, the scheme for certification of parent trees of grapefruit against psorosis [virus] has been abandoned. The scheme of certification for parent orange-trees is going well, although the general inspection of citrus orchards for scaly bark [psorosis] has been reduced to allow for other necessary inspections.

Inspection of vineyards for bacterial blight [*Erwinia vitivora*: ibid., xx, p. 151] is being continued very slowly. About 13,000,000 vines and 200 registered nurseries were examined in Somerset West, Stellenbosch, Paarl, Wellington, Worcester, Robertson, Montagu, Swellendam, Bonnievale, Tulbagh, and Caledon. The farms of two registered nurserymen were placed in quarantine owing to infection.

#### **Research and farming 1943. Sixty-sixth Annual Report of the North Carolina Agricultural Experiment Station, 1942-3.—122 pp., 68 figs., 1943.**

The following items of interest are in this report [cf. *R.A.M.*, xxiv, p. 405]. Semesan-treated and untreated maize seed was grown at three different Stations in North Carolina. A 1.5 per cent. increase in stand resulted at the Piedmont Branch Station Farm, a 5 per cent. increase at the Upper Coastal Plain Branch Station, and none at Blackland. The differences are possibly related to conditions during the germination period. The small cost of treatment (7 cents per bush.) is considered to be, however, a reasonable insurance against poor stands.

It was proved during tests in 1943 at the Upper Coastal Plain Branch and McCullers Stations that less treated cotton seed was required than untreated to make a satisfactory stand. Du Bay 1452-C was found to be the most efficient seed protectant, new improved ceresan, arasan, Dow No. 5, GCC No. 1, and spergon also giving highly significant increases in yield in that order.

Du Bay 1452-C and spergon seem promising for groundnut seed treatment. Treatment with arasan, 2 per cent. ceresan, or yellow cuprocid resulted in 75 per cent. germination and spergon in 68 per cent. compared with 54 in the untreated [ibid., xxv, p. 332]. It was also shown that the seed of the Virginia Bunch variety can be safely treated and stored for any reasonable time before planting [ibid., xxv, p. 249]. Systematic counts showed that *Cercospora* leaf spot (*C. arachidicola* and *C. personata*) is less severe when the groundnuts are used in rotations than in continuous culture. Overwintering sclerotic tissue produces conidia the next spring (late May in the Upper Coastal Plains). They are increased by damp, warm weather and periods of heavy dew and are spread some distance by wind, insects, particularly leaf-hoppers [ibid., xxv, p. 536], and water currents from flooded rows. Inoculations with conidia showed that the incubation period for *C. arachidicola* was 7 to 10 days and for *C. personata* 12 to 20; that infection takes place equally well whatever the weather conditions or age of plant; that Spanish types are the most susceptible; and that dusting not later than eight days after inoculation gave 100 per cent. control and remained effective for two weeks. Spanish seed groundnuts are the better if shelled and treated at planting time; unshelled seeds must be used in greater quantities to get satisfactory results. Significant increases in

nodulation and yields of Virginia Bunch were gained when soils naturally or artificially contaminated with nodule-forming bacteria were added to soils not previously planted with groundnuts; seed treatment just before planting did not seem to interfere with nodulation when this method was used.

The bacterial pustule disease [*Xanthomonas phaseoli* var. *sojense*] causing defoliation of soy-bean is very prevalent in North Carolina and survives the winter in dead leaves and some seeds from diseased plants. Seed treatment failed to check the disease and growers are recommended to use either resistant varieties or seed from fields hardly attacked by the disease. The Ogden, Ootootan, Palmetto, and Woods Yellow varieties were found to be rather more resistant than others. A second and as yet unidentified leaf-spotting bacterial disease was found in 1942 and 1943 and under some conditions was even more destructive.

New spray treatments against tobacco blue mould [*Peronospora tabacina*] were tried during 1943; bismuth subsalicylate at 12 oz. in 50 gals. spray with 8 oz. vatsol O.T.C. as wetting agent and fermate 1 lb. in 50 gals., wetting agent optional, both proved equal or superior to the regular copper oxide-oil mixture [ibid., xxvi, pp. 33, 135]. Tobaccos resistant to Granville wilt [*X. solanacearum*] showed good quality and yield in 1943 when planted in contaminated soil; hybrids of T.I. 448 A parentage showed less than 5 per cent. wilt where standard varieties were a complete loss. A soil treatment with uramon at 1,000 lb. per acre on contaminated soil yielded a good crop after a maize rotation [ibid., xxiii, p. 460].

In order to combat the now serious bacterial wilt of tomato [*X. solanacearum*] resistant lines are being developed and field tests showed that the progeny of the cross between Louisiana Pink and T 414 (from Porto Rico—P.I. No. 3814) were highly resistant compared with other crosses.

During seed treatments of lettuce the materials found to be very beneficial were yellow cuprocide and spergon which gave from 10 to more than 100 per cent. stand increases and allowed a much lower rate of seeding.

The apple diseases black rot [*Phylospora obtusa*] and bitter rot [*Glomerella cingulata*: ibid., xxiv, p. 195] reached epidemic proportions in 1943. Bordeaux 4-4-50 was again most effective in controlling bitter rot; the weaker concentration (1-3-50) did not reduce spray injury as effectively as in previous years. Of the substitutes tried only fermate was found to equal Bordeaux in bitter-rot control. Fermate used at 3-5-10 was also found to be most effective for controlling black rot, the next best being Bordeaux at 4-4-50 and Tennessee copper '26' at 3-3-50.

DESLANDES (J. A.). **Observações fitopatológicas na Amazônia.** [Phytopathological observations in Amazonia.]—*Bol. fitossan. Minist. Agric., Rio de J.*, i, 3-4, pp. 197-242, 5 col. pl., 23 figs., 1944. [Received May, 1947.]

The main object of the author's first visit to Pará in November and December, 1937, was to verify a rumour, which proved to be unfounded, as to the occurrence of cotton wilt (*Fusarium vasinfectum*) in the State. On the second occasion, in June and July, 1944, the tour of inspection also covered Amazonia. Among the pathogens affecting the crop in Pará, mostly in a mild form, are *Ramularia areola*, *Cercospora* (?) *gossypina*, *Bacterium* [*Xanthomonas*] *malvacearum*, and *Colletotrichum gossypii* var. *cephalosporioides* [*R.A.M.*, xviii, p. 798].

A root rot of cassava in waterlogged soils in Amazonia was tentatively attributed to asphyxiation, a similar condition also being noted near Belém, Pará. *Phytophthora manihoti* [cf. ibid., xxv, p. 103; xxvi, p. 287] was found to be coextensive with the cultivation of cassava, but the damage caused was usually slight. The leaf spots due to *Cercospora caribaea* and *C. henningsii* [ibid., xx, p. 445] were likewise present but unimportant.

Two major banana diseases, viz., Sigatoka (*C. musae*) [*Mycosphaerella musicola*] and Panama (*Fusarium oxysporum* var. *cubense*), occur in both States, while

*Chloridium musae* [ibid., xxv, p. 220] and *Cordana* [*Scolecotrichum*] *musae* were commonly encountered in Amazonia.

A species of *Corticium*, believed by Dr. A. Bitancourt to be new to science, is responsible for the so-called 'areolate spot' of *Hevea* rubber leaves, consisting of necrotic, chestnut- or light-coloured areas which are disposed in rings, haloes, or other patterns, and become perforated or lacerated by the wind. There are two centres of infection in Pará, where the disease was first recognized in 1943, one at Belterra and the other at Belém, and cases have also been reported from Manaus, Amazonia. The leaf spot, to which C. Townsend, of the Ford Company, attributes considerable economic importance, attacks plants of all ages. Besides *H. brasiliensis*, *H. pauciflora*, *H. benthamiana*, *H. spruceana*, and *H. guayanensis* are susceptible. The ready transmissibility of infection may be gauged by the incidental observation that a number of scions dipped before grafting in water previously used to obtain spore suspensions from diseased foliage contracted the leaf-spot symptoms.

Mention has already been made of the Ford Company's energetic campaign against *Dothidella* [or *Melanopsammopsis*] *ulei* in Amazonia [ibid., xxv, p. 72]. The method employed in the production of resistant budding material consists in forcing growth from the upper parts of the stems of selected trees. In 1944 the young shoots were observed to be suffering from a disease closely resembling the above-mentioned cassava bacteriosis both in its external and internal features. Cultures from the infected tissues failed to yield any micro-organisms, but a bacterium is presumed to be concerned in the etiology of the trouble. *D. ulei*, *Diplodia* sp., and *Gloeosporium* sp. were found on the dead branches. Since the disease involves valuable breeding material it is of potential economic importance and precautions are being taken to prevent its spread on the Ford Company's estates.

The incidence of pink disease (*C. salmonicolor*) appears to be limited to one plantation at Belém, Pará. Other organisms occurring on rubber are *Catacauma huberi* [ibid., v, p. 324], *Phytophthora palmivora*, *Phyllosticta* (?) *heveae*, *Cephaleuros virescens* [*C. mycoidea*], and *Sphaeronema fimbriatum* [*Ceratostomella fimbriata*].

The Amazonian cacao plantings suffer from the ravages of witches' broom (*Marasmius perniciosus*) [ibid., xxvi, p. 287]. In the Belém region of Pará, *Theobroma grandiflora* sustains even heavier damage from the disease than cacao itself and acts as a copious source of infection, which should not be overlooked in the organization of control measures. *Phytophthora palmivora*, a limiting factor in cacao production in Bahia [loc. cit.], is also rife in Amazonia, but data and observations relating to pod rot in the latter State are lacking. Secondary deterioration of the pods is associated with the ubiquitous *Lasioidiplodia* [*Botryodiplodia*] *theobromae*, which is also responsible in a primary capacity for black rot. A few cases of thread blight (*Corticium koleroga*), referred by Briton Jones to *Marasmius* [ibid., xiii, p. 540], were noted, other hosts of the same fungus including coffee, *Syzygium jambolana*, mango, and orange. On large mango trees, notably in dense, heavily shaded plantings in Manaus and Igarapé-Açu, extensive areas of the crown were shrivelled and whitened by the adherent leaves, on which the framework of the mid and lateral veins was thickly coated with the fungus.

The blight caused by *C. microsclerotia* [ibid., xix, p. 3] was observed for the first time in Pará in June, 1944, the most susceptible hosts apparently being various types of French and Lima beans [*Phaseolus vulgaris* and *P. lunatus*] and cowpea. Severe infection was further observed on turnip, mustard, okra (*Hibiscus esculentus*), and castor [*Ricinus communis*], while material for examination was also collected on sugar-cane, cassava, potato, eggplant, papaw, cucumber, radish, and *Dolichos lablab*.

Among the diseases of miscellaneous plants may be mentioned an extensive circular, zonate spotting of the lower leaf surfaces of mulberry at Manaus by a

species of *Cephalosporium*, and the more prevalent foliar infections due to *Myco-sphaerella mori* and *Cercospora* sp.

Among the fungi observed on rice leaves were *C. (?) oryzae*, *Piricularia oryzae*, and a *Helminthosporium* sp.

Cashew nut [*Anacardium occidentale*] leaves bore lesions caused by *Cephaleuros mycoidea*, *Gloeosporium* sp., and *Parodiella* sp., the last-named being apparently parasitized by a species of *Cicinnobolus*.

The Amazonian sugar-cane crop seemed to be very healthy, mosaic being detected only in insignificant traces, even in the old indigenous varieties; other organisms noted were *Leptosphaeria sacchari*, *Melanconium* [*Pleocyta*] *sacchari*, and *Schizophyllum commune*.

*Leandria momordicae*, *Oidium* sp., and *Acremonium* sp. occurred on the foliage of vegetable marrow, cucumber, melon, and other cucurbits, cucumbers also being infected by *Peronosplasmopara* [*Pseudoperonospora*] *cubensis* and vegetable marrows by *Rhagdolobium cucurbitacearum*.

Tobacco showed infection by the tobacco-mosaic virus and *Cercospora nicotianae*, while other observations included *Phytophthora* [*X.*] *solanacearum* on eggplant and chilli, the latter also being attacked by *Sclerotium rolfsii*, *C. beticola* on beet, *Macrosporium* [*Alternaria*] *porri* and *M. parasiticum* [*Pleospora herbarum*] on onion, *C. hibiscina* on *H. esculentus*, a dry root rot of jak tree caused by an undetermined species of *Rosellinia* (the only case of this disease yet recorded in Amazonia), *X. solanacearum* in a devastating form on tomato, precluding the cultivation of the crop in certain localities and seasons, and milder infection of the same host by *Cladosporium fulvum*, *Septoria lycopersici*, and *Sclerotium rolfsii*.

*Septobasidium* spp. were the most prevalent entomogenous fungi, followed by *Aschersonia* spp., e.g., *A. basicystis*, *A. turbinata*, and *A. aleyrodis* [ibid., xxvi, p. 130], *Hirsutella verticillioidea* on the rubber pest, *Leptopharsa heveae*, *Acrostagmus*, *Podonectria*, and *Sphaerostilbe* spp. on citrus coccids, and *Myriangium duriae* [ibid., xx, p. 61] on the mulberry aphid.

DE ROPP (R. S.). **The isolation and behaviour of bacteria-free crown-gall tissue from primary galls of *Helianthus annuus*.**—*Phytopathology*, xxxvii, 4, pp. 201–206, 3 figs., 1947.

Unlike the tissues isolated from crown galls (*Phytophthora* [*Bacterium*] *tumefaciens*) on tobacco and tomato, which uniformly contained viable bacteria, the interior tissues of primary galls on sunflowers were frequently found to be free of the pathogen and new strains of tissue similarly devoid of the organism could be obtained from the same source [*R.A.M.*, xxvi, p. 289]. Tumour tissue thus procured was usually mixed with normal material and tended to throw out roots for some time after its original isolation. These roots are thought to have arisen from fragments of normal tissue embedded in the excrescences and stimulated into activity by growth substances generated by the crown galls.

The primary galls yielded two types of tissue, one hard and woody with a fairly well-defined internal structure, and the other soft and translucent. On prolonged culture the former was inclined to change into the latter.

GREENWOOD (M.) & POSNETTE (A. F.). **A morphological change induced in leaves of *Theobroma cacao* by mineral deficiency.**—*Nature, Lond.*, clix, 4042, pp. 542–544, 3 figs., 1947.

In the course of breeding work against swollen shoot, symptoms of lime-induced chlorosis appeared on cacao seedlings potted in a mixture of soil, compost, and marine sand containing a high percentage of shell, and which had been watered with limed water. In addition to symptoms of acute iron deficiency [*R.A.M.*, xxiv,

p. 11], some plants showed sharp dentations at the leaf tip. This deformity occurred in an exaggerated form in cacao seedlings grown in water cultures without iron and manganese. The basic solution of Reeve and Shive (*Soil Sci.*, lvii, p. 1, tab. 1, 1944) was used at a potassium concentration of 50 p.p.m. plus 0.5 p.p.m. each of boron and zinc, and adjusted weekly to pH 6. There were four replicates, all of which gave deeply indented leaves in a flush that developed 11 to 13 weeks after transference to culture. Eleven out of a total of 15 leaves were chlorotic and later developed leaf-scorch. The plants ceased elongation after 20 weeks in culture and produced no more leaves before dying.

The four plants had been selected at random from twenty seedlings grown for 11 weeks in quartz sand and distilled water. The remaining sixteen seedlings, grown under parallel conditions in solutions containing 1 p.p.m. iron and 0.25 p.p.m. manganese, had entire leaves. Only entire leaves were formed by a second series of forty plants, including eight lacking only iron and eight only manganese, grown for periods of up to 30 weeks in the same basic solution.

ANDRÉN (F.). **Resultat av betningsförsök met stråsåd.** [Results of disinfection experiments with cereal seed.]—*Växtskyddsnotiser*, *Växtskyddsanst.*, *Stockh.*, 1947, 1, pp. 1-4, 1947.

A tabulated account is given of the 1944-5 and 1945-6 seed-grain disinfection experiments at the Stockholm Plant Protection Institute [cf. *R.A.M.*, xxv, p. 207]. The incidence of loose smut of oats [*Ustilago avenae*] in the summer crop of 1945 was reduced from 27.6 plants per 10 sq. m. in the untreated plots to 0.2 by betoxin 61 (at the rate of 300 gm. per 100 kg.), panogén (200 ml.), and uspulun (300 gm.); to 0.3 by fusariol dust, panogén (400 ml.), and uspulun (600 gm.), to 1.6 by abavit-neu (300 gm.), and to 3.9 by germisan (300 gm.). Uspulun (300 gm.) gave the largest yield (3,514 kg. per ha. compared with 3,314 in the control plots), followed by betoxin 61 (3,484 kg.). The most effective control of barley stripe [*Helminthosporium gramineum*] was obtained with double dosage of panogén (400 ml.), which reduced the number of diseased plants per 10 sq. m. from 451.8 to 0.5. In none of the other treatments did the corresponding figure fall below 1 to 2, and in the plots from germisan-dusted seed it was 3.5. Panogén at 400 ml. likewise resulted in the heaviest yield (3,542 kg. per ha., compared with 3,285 in the control plots), closely followed by betoxin 61 (200 gm.), uspulun (200 gm.), and germisan (3,536, 3,531, and 3,530 kg., respectively).

The above-mentioned preparations, with the addition of liquid uspulun (0.125 per cent.) and germisan (0.1 per cent.), were also tested against rye fusarioses [including *Calonectria graminicola*] and wheat bunt [*Tilletia caries* and *T. foetida*] in the 1945-6 winter crops with satisfactory results. There were no remarkable differences in efficiency between the various chemicals.

In 1946 summer oats and barley crops were treated against *U. avenae* and *H. gramineum*. Lunasan (300 gm.), agrosan GN [ibid., xxii, p. 56] (350 gm.), and semenon (a Finnish product) (300 gm.) reduced the number of smutted oat plants per 10 sq. m. from 20.2 to 0.2, 0.5, and 0.3, respectively, and raised the yield from 2,825 to 2,891, 2,944, and 2,840 kg. per ha., respectively. The corresponding figures for panogén, betoxin 61, and uspulun dust were 0.7, 0, and 0.3 infected plants and 2,921, 2,794, and 2,850 kg. per ha., respectively. It is apparent from these data that lunasan, agrosan GN, and semenon are of approximately equal efficacy with the standard Swedish preparations, of which betoxin 61 entirely eliminated loose smut, as also did mercuric chloride-formalin. The number of striped barley plants was reduced from 223.5 to 0.5, 1, 1.2, 1.5, and 1.6 per 10 sq. m. by betoxin 61 (200 gm.), semenon (200 gm.), lunasan (200 gm.), agrosan GN (300 gm.), and panogén. The maximum yield of 3,681 kg. per ha. as compared with 3,167 in the control plots was obtained with lunasan.

AUSEMUS (E. R.), STAKMAN (E. C.), HANSON (E. W.), GEDDES (W. F.), & MERRITT (P. P.). **Newthatch Wheat.**—*Tech. Bull. Minn. agric. Exp. Sta.* 166, 20 pp., 2 figs., 1944. [Received May, 1947.]

The wheat variety Newthatch, produced by crossing the Hope and Thatcher varieties and back-crossing to Thatcher twice, is resistant to both stem [black] rust [*Puccinia graminis*] and leaf [brown] rust [*P. tritici*: *R.A.M.*, xxv, p. 297]. It gave consistently high yields but seemed better adapted to the spring wheat areas. In tests to determine the reaction to bunt [*Tilletia caries* and *T. foetida*], scab [*Gibberella zeae* and *Fusarium* spp.], root rot [*Helminthosporium sativum* and *Pythium* sp.], and black chaff (*Bacterium* [*Xanthomonas*] *translucens* var. *undulosum*) Newthatch was more susceptible than Thatcher. It resembles Thatcher in appearance, having approximately the same date of heading and maturity, height, seed characters, and ability to withstand lodging.

PETIT (A.). **Les charbons de l'Orge et de l'Avoine en Tunisie. Transmission et moyens de préservation.** [The smuts of Barley and Oats in Tunis. Transmission and preventive measures.]—*Bull. Serv. Bot. Agron. Tunis* 3, 12 pp., 1946.

This bulletin describes the transmission of the covered smut of barley [*Ustilago hordei*] and the loose and covered smuts of oats [*U. avenae* and *U. kolleri*] and recommends immersion in formalin and the sprinkling method as wet treatments for both cereals. The dry sulphur treatment, 350 gm. per quintal, is advocated for barley and the dry copper treatment for oats.

YOUNG (G. Y.), LEFEBVRE (C. L.), & JOHNSON (A. G.). **Helminthosporium rostratum on Corn, Sorghum, and Pearl Millet.**—*Phytopathology*, xxxvii, 3, pp. 180–183, 2 figs., 1947.

*Helminthosporium rostratum*, originally described by Drechsler [*R.A.M.*, iii, p. 65] and tentatively reported by Bunting on maize in the Gold Coast [ibid., vii, p. 231], was isolated in 1944 from leaf spots on the same host from Mississippi and Georgia, on various types of sorghum and Sudan grass from Florida, and on Pearl millet (*Pennisetum glaucum*) [*P. typhoides*] from Georgia. Six cultures from the foregoing sources were pathogenic on the several hosts in inoculation experiments, maize and *P. glaucum* being the most susceptible and the sorghums, especially Leoti, highly resistant.

LEVITT (E. C.). **Armillaria root rot control.**—*Agric. Gaz. N.S.W.*, lviii, 2, pp. 67, 71, 2 figs., 1947.

A cheaper method has been devised to control *Armillaria mellea* root rot of citrus in which a jet of water is used to expose crown roots instead of an air jet [*R.A.M.*, xxvi, p. 74]. A tractor-drawn spray plant carrying a single nozzle fitted with a  $\frac{1}{8}$ -in. aperture plate only is operated at 250 to 300 lb. per sq. in. In soil considered too hard for hand-working the crown roots were safely bared in  $3\frac{1}{2}$  to 5 minutes; the water used ranged from 9 to 14 gals. per tree.

ARNOT (R. H.). **Potassium deficiency in coastal soils. A cause of decline in Citrus and Passion Fruit.**—*Agric. Gaz. N.S.W.*, lviii, 2, pp. 72–74, 1 fig., 1947.

A condition of decline ('burnt leaf') of orange trees in the Gosford and Moorlands districts of New South Wales, and of passion fruit vines at Moorlands and Mangrove Mountain is found to be associated with an abnormally small amount (less than 0.2 per cent.) of potassium [*R.A.M.*, xvi, p. 313; xxii, p. 63; xxiii, p. 386] in the tissues. The condition usually occurs on grey, sandy, low-lying soil commencing in spring with weak new growth followed by a die-back at the base. The twig develops a necrotic spot just above the previous season's growth, yellows, and dies

while the mature leaves also turn yellow. Fruit yield is very poor and in bad cases the tree may be nearly defoliated. Field trials with potash fertilizers yielded promising results. Since the spring of 1938 the decline has occurred sporadically on oranges but occurred only in 1945 on passion fruit.

[The information concerning citrus decline is also given in *J. Aust. Inst. agric. Sci.*, xii, 3, pp. 110–113, 1 fig., 1946.]

ASTHANA (R. P.). **Bacterial root-rot of Citrus.**—*Mag. agric. Coll. Nagpur*, xxi, 3–4, pp. 77–79, 1947.

Dead, dark brown cracks up to 2 cm. long and patches were observed on the roots of orange and mosambi (*Citrus sinensis*) plants exhibiting die-back symptoms of yellowing, sudden wilt, and decline. In advanced stages the bark cracked longitudinally, rotted, and fell off. In a few cases wither-tip was also noticed [*R.A.M.*, xiii, p. 436], but this bears no specific relationship to the root rot which is attributed to bacteria. Bacteria were the sole isolate in the early stages of infection, but a species of *Fusarium*, later shown to be non-pathogenic, was invariably associated in advanced stages. Pathogenicity of the bacterium was established in inoculation experiments with two 1½-year-old healthy orange plants which developed the brown, necrotic spots on the roots and the yellowing of the leaves within five days of the inoculation. The same bacterium was obtained on reisolation and was found in the roots with a gum-like substance in the xylem vessels as in naturally affected roots. Further work is in progress on what is thought to be a new species of bacterium.

BLISS (D. E.). **The use of fungicides against spoilage in Dates.**—*Rep. Date Grs' Inst.*, 1946, pp. 13–17, 1946.

An account is given of field experiments carried out from 1940 to 1945 in California to find a non-toxic fungicide to prevent fruit spoilage of dates due chiefly to *Aspergillus niger*, *A. citri*, and *Pleospora herbarum* [*R.A.M.*, xx, pp. 254, 255]. Eleven fungicides were applied during this period on dates mainly of the Deglet Noor variety, 1945 being the only year when the weather caused serious fruit spoilage.

Significant spoilage reductions were obtained after the following treatments: sulphur dust in 1943; sulphur dust and the same plus 5 per cent. fermate in 1944; the fermate-sulphur mixture and a dust containing 10 per cent. yellow cuprocide plus sulphur in 1945. In 1945 fermate-sulphur mixture kept the spoilage down to 11.11 per cent. compared with 53.18 among the untreated dates.

In the laboratory the fungicides were satisfactorily removed with a dried cloth while a shaker-table lined with towelling or rotating brushes gave good cleaning results in the packing-house; the dark colour of the fermate-sulphur residue rendered it less conspicuous. These fungicides did not greatly alter the palatability of the dates and those treated with the fermate-sulphur mixture were thought to be essentially as palatable, attractive, and free from poisonous effects as the non-treated fruits.

It is suggested to growers wishing to test the 5 per cent. fermate in sulphur dust that since this is a fruit protectant with acaricidal properties against the date mite [*Paratetranychus*] as well as being fungicidal, it is desirable to maintain a thorough coverage of all fruit surfaces from midsummer until fruit maturity.

CHRISTIDIS (B. G.). Ἀπολύμανση τοῦ βαμβακόσπορου γιὰ νὰ προστατευθοῦν τὰ βαμβάκια στῇ μικρῇ τοὺς ἡλικίᾳ. [Cotton seed treatment for controlling seedling diseases.]—*Sci. Bull. Cott. Res. Inst., Sindos*, 1, pp. 23–32, 3 graphs, 1947. [Greek, with abridged English translation.]

This is an account of cotton seed treatment in Greece from 1943 to 1946 against a damping-off disease caused by unspecified organisms [*R.A.M.*, xxv, p. 261]. The

results, although mainly satisfactory, were greatly influenced by variety and environmental conditions. Acala always responded well to seed treatment, while others, such as 12 x 8 and 6 x 17, were satisfactory with or without treatment. The treatment naturally was more effective under conditions favourable to the damping-off organisms, disinfection being essential for early sowings. Road dust significantly increased seedling emergence almost as much as cerasan, while wood ashes slightly lowered seedling survival without affecting the yield, and lime proved indifferent. Dust was applied at 6 gm. cerasan or 3 gm. granosan per kg. seed with a higher rate for fuzzy than for delinted. This dust treatment seems preferable to disinfection by sulphuric acid.

McKAY (R.). **Flax diseases.**—55 pp., 23 pl., Dublin, Flax Development Board, 1947. 5s. 0d.

Finding in the course of a survey of flax diseases in Eire in 1945 that the scattered information on this subject in scientific and agricultural journals was totally inaccessible to the ordinary farmer, the author compiled in a simple and readable form the essential facts concerning the principal maladies of the crop. These fall into four sections, viz., (i) fungus diseases, comprising seedling blight (*Colletotrichum linicola*), stem break and browning (*Polyspora lini*), rust and firing (*Melampsora lini*), grey mould (*Botrytis cinerea*), flax wilt (*Fusarium lini*), *Sclerotinia* disease (*S. sclerotiorum*), damping-off (*B. cinerea*, *C. linicola*, *Thielaviopsis basicola*, *Rhizoctonia*, etc.), root rot (*T. basicola*), *Rhizoctonia* sp. (apparently distinct from the potato strain [*Corticium solani*]), powdery mildew (*Erysiphe polygoni*), pasmo (*Sphaerella linorum*), and *Alternaria* sp.; (ii) parasitic flowering plants; (iii) non-parasitic troubles, including 'droop' [*R.A.M.*, xxiii, p. 17]; and (iv) insect pests. Bibliographical references and a useful glossary of scientific terms are provided.

BLACK (M. A.). **Effect of cerasan on the germination of stored Linen-Flax seed.**—*N.Z. J. Sci. Tech.*, A, xxviii, 3, pp. 217–218, 1946.

Cerasan treatment, wet or dry, did not reduce the germinability of Concurrent linen-flax seed stored at moderate temperature (55° to 75° F.) and low humidity (average 50 per cent.) for 3½ years at the Plant Research Bureau, Lincoln, New Zealand.

NEERGAARD (P.). **Sygdomme og Skadedyr paa Stueplanter. 2. forøgede Udgave.** [Diseases and pests of indoor plants. Second enlarged edition.]—64 pp., 34 figs., Copenhagen, J. F. Clausens Forlag, 1946.

This well-illustrated booklet falls into three sections, of which the first deals in general terms with the physiogenic and infectious diseases and with the pests of indoor plants in Denmark [*R.A.M.*, xxv, p. 343]; the second lists the several disorders of individual plants; and the third comprises recommendations for prophylaxis by hygienic methods of cultivation and direct control with fungicides and insecticides.

LE BEAU (F. J.). **A fungicide for protecting Lily bulbs from infection by *Colletotrichum lilii*.**—*Phytopathology*, xxxvii, 3, pp. 194–196, 1 fig., 1947.

The use of puratized N5E for the control of Easter lily (*Lilium longiflorum* var. *eximium*) bulb infection by black scale (*Colletotrichum lilii*) in Louisiana [*R.A.M.*, xxiii, p. 487] was reported in *Phytopathology*, xxxvi, pp. 391–393, 1946. Subsequent tests showed that the chemical, while destroying the fungus in diseased tissue, conferred little or no protection against re-infection from contaminated soil. Encouraging results having been given in preliminary greenhouse tests in 1944 by dusting infected bulbs with arasan after treatment with puratized N5X,

three series of field trials were carried out in 1945-6 to compare the effects of a combined treatment using puratized N5E (1 in 2,000, 48 hours' immersion) and arasan dust treatment (applied 24 hours later) with either alone on diseased bulbs planted in infested soil, arasan also being used on clean bulbs. Neither fungicide was effective by itself, but the combination proved highly successful in the eradication of the fungus from the diseased tissues, while dusting with arasan alone prevented black-scale development on bulbs in infested soil.

Disease indices for the various treatments were obtained by adding the products of the numbers of bulbs in each class, viz., clean, mildly, moderately, and severely diseased, and the numerical values of the classes 0, 33.3, 66.6, and 100, respectively, and dividing by the total number of bulbs in each treatment. On this basis the indices for the two combination-treatment tests were 4.3 and 5.1 and for arasan alone on clean bulbs 4.9, the corresponding figures for the controls being 97.7 and 41, puratized N5E 48.9 and 26, and arasan on diseased bulbs 72.3.

**LIMBER (D. P.). The observed frequency of mature pycnidia of *Septoria gladioli* on *Gladiolus* corms.**—*Phytopathology*, xxxvii, 3, pp. 190-191, 1947.

*Gladiolus* corms in ten consignments (out of 150) from Holland, England, Australia, and Canada examined at the Bureau of Entomology and Plant Quarantine inspection house at Hoboken, New Jersey, between 14th January and 15th June, 1946, bore advanced hard-rot (*Septoria gladioli*) [*R.A.M.*, xxvi, p. 58] lesions on which the rare mature pycnidial stage of the fungus was present [*ibid.*, v, p. 164; xix, p. 353]. The environmental conditions resultant on packing for transport may contribute to the development of pycnidia. Some of the affected lots, however, arrived in well-ventilated packages, so it seems probable that fruiting pycnidia are more common on *gladiolus* corms than has hitherto been supposed.

**Plant Diseases. Diseases of Dahlias.**—*Agric. Gaz. N.S.W.*, lviii, 2, pp. 90-92, 5 figs., 1947.

Dahlias are subject to infection by several virus diseases, the two most important in New South Wales being spotted wilt caused by the tomato spotted wilt virus [*R.A.M.*, xxii, p. 279], which is almost universally present, and stunt [dahlia mosaic virus: *ibid.*, xxvi, p. 32]. Powdery mildew (*Erysiphe cichoracearum*) and leaf spot (*Entyloma dahliae*) [*ibid.*, xx, p. 119; xxvi, p. 32] also cause damage in some seasons. Notes are given on the symptoms and control of these diseases.

**ZWARTENDIJK (J.). Is de aantasting van *Pestalozzia guepini* op *Rhododendron* primair of secundair?** [Is the infection by *Pestalotia guepini* on *Rhododendron* primary or secondary?]—*Tijdschr. PlZiekt.*, liii, 2, p. 55, 1947.

The writer has observed that infection by *Pestalotia guepini* on *Rhododendron* [*R.A.M.*, xxii, p. 482] invariably occurs on foliage injured by various agencies. In a recent grafting experiment in the nursery of the Phytopathological Service at Boskoop, *Rhododendron* scions treated with ethylene chlorhydride were shortly afterwards attacked by the fungus, whereas the controls and those dipped in hot water remained free from infection. Thus, *P. guepini* evidently occurs in a secondary capacity, at any rate on cultivated shrubs, and every precaution should therefore be taken against damage to the leaves.

**McCLELLAN (W. D.). Efficacy of certain soil fumigants and fertilizers against crown rot in annual Larkspur caused by *Sclerotium rolfsii*.**—*Phytopathology*, xxxvii, 3, pp. 198-200, 1947.

On 12th and 13th December, 1945, soil fumigants were applied to plots 18 by 9 ft. in a field in the Rio Grande Valley, Texas, where extensive losses among annual

larkspurs (*Delphinium ajacis*) had been caused for several years by *Sclerotium rolfsii* [*R.A.M.*, xxi, p. 138]. Seed of the Imperial Los Angeles variety was sown on 9th January and nitrogenous fertilizers were applied to non-fumigated plots on 30th January, 20th February, and 20th March, 1946. On 15th April the numbers of healthy plants were as follows: chloropicrin (28·7 gals. per acre), 237; carbon disulphide (102·2), 185; iscobrome No. 2, consisting of 60 per cent. xylol, 15 per cent. methyl bromide, and 25 per cent. chloropicrin (57·5), 199; ETN mixture (15 per cent. ethylene dibromide, 20 per cent. tetrachlorethane, and 65 per cent. naphtha thinner, at 51·1 gals per acre), 170; three side-dressings of ammonium sulphate (735 lb. per acre), ammonium nitrate (450), cyanamide (712·5), uramon (356·8 and 712·5), 144, 248, 155, 154, and 189, respectively; uramon (950) and ammonium nitrate (1,200) broadcast before planting, 18 and 19, respectively; and untreated, 115. Chloropicrin, carbon disulphide, iscobrome No. 2, and the ammonium nitrate and uramon (712·5 lb.) side-dressings resulted in statistically significant increases [cf. *ibid.*, xxi, p. 399].

THOMAS (H. EARL) & BAKER (K. F.). **A rough-bark disease of *Pittosporum tobira*.**—*Phytopathology*, xxxvii, 3, pp. 192–194, 1 fig., 1947.

The most injurious effect of a disease of *Pittosporum tobira* of some years' standing in central and southern California is a necrosis and subsequent sloughing-off of the outer bark. The decay may extend sufficiently far into the bark to girdle and kill the branch, which in such cases bears only terminal clusters of a few small, rolled leaves. The shrubs are abnormally small and may gradually die. Foliar symptoms are of various types, of which the mildest consists of diffuse, chlorotic yellow to tan blotches, sometimes enclosing green islands; others are an oak-leaf or watermark pattern, especially along the midrib; small, angular, yellow areas suggestive of *Cercospora* [*pittospori*: *R.A.M.*, xx, p. 67]; and, more rarely, ring spots with concentric, yellow lines or moiré designs. *P. viridiflorum* and variegated *P. tobira* displayed similar symptoms but were not included in this study.

The disease is carried in cuttings but is not completely systemic, since less than half of those from affected plants developed symptoms while the active principle seems to be seldom or never transmitted through the seed. In inarch-grafting experiments with diseased scions of *P. tobira* with bark symptoms and *P. crassifolium*, with leaf symptoms only, on healthy *P. tobira* stocks gave positive results (on the leaves only in the latter case). Some indications of slow natural spread were observed in gardens at Berkeley. The connexion, if any, between this disease and the virus on *P. daphniphylloides* (*Mon. Bull. Calif. Dep. Agric.*, xxix, pp. 158–159, 1940) is not yet clear.

SARASOLA (A. A.). **Dos enfermedades semejantes causadas por *Botrytis cinerea* y *Ovularia viciae* en las Alverjillas forrajeras (*Vicia* spp.).** [Two similar diseases caused by *Botrytis cinerea* and *Ovularia viciae* in fodder Vetches (*Vicia* spp.).]—*Publ. tec. Dir. Agric., B. Aires*, iii, 3, 16 pp., 4 figs., 1946.

The material on which this comparative study was based consisted of vetch plants infected by *Botrytis cinerea* at La Estanzuela, Uruguay, and by *Ovularia viciae* in La Plata, Argentina. The spots produced on the leaves by the former species are reddish-brown, circular, oblong, or irregular, up to 3 (generally 0·5 to 1) mm. in diameter, while those on the stems, petioles, and tendrils measure 4 to 5 mm. The fungus causes partial defoliation and may entirely destroy the other organs. The lesions due to *O. viciae* on the leaflets are dark brown, 1 to 4 mm. in diameter, with a thickened margin, and covered with white dots, consisting of fascicles of hyaline, flexuous, simple, non- to triseptate conidiophores, 71·4 to 198·9 by 3·8 to 5·1  $\mu$ , and hyaline, spherical or subspherical, unicellular conidia, with a basal papilla 8·9 to 15·3 by 7·6 to 14  $\mu$ .

Positive results were given by inoculation with *B. cinerea* on *Vicia benghalensis*, *V. sativa*, *V. villosa*, broad bean, and *V. faba* var. *minor*, and with *O. viciae* on *V. benghalensis* and *V. villosa*.

The use of resistant varieties and crop rotation are advocated for the control of both pathogens. *V. sativa* showed a very high degree of resistance to *O. viciae*.

ROBERTS (WINIFRED O.). **Simplifications of the Roach method of diagnostic plant injection.**—*J. Pomol.*, xxii, 3-4, pp. 184-188, 1 pl., 3 figs., 1947.

The author describes two modifications of the Roach method of diagnostic injection for the detection of nutrient deficiencies in plants [*R.A.M.*, xxiv, p. 334]. In one, a short length of soft, white cotton thread impregnated with the test solution and then dried is drawn with a fine darning-needle through a leaf petiole or other tissue; the ends are cut on either side, leaving a short length in the plant. In the other, a pad of cotton-wool moistened with the solution is bound with adhesive tape over the wound caused by removing a leaf at the base of the petiole. The resulting distribution of the reagent in the plants tested (apple, pear, quince, and *Hydrangea*) was identical with that given by the Roach method. Trials are unaffected by wind, rain, or capillary creeping of the solution over hairy surfaces.

KIDSON (E. B.). **Mineral deficiency of Apple leaves: distribution of magnesia, potash and lime in the leaves of young shoots.**—*N.Z. J. Sci. Tech.*, A, xxviii, 3, pp. 173-182, 1946.

An examination in December, 1940, of the mineral composition of the current season's leaves on Cox's Orange apple trees from three different localities in the Nelson district of New Zealand revealed variations in mineral content with position on the leader, and that where magnesium [*R.A.M.*, xxiii, p. 233] or potassium deficiencies occurred the element in low supply tended to be highest in the young leaves near the growing point when calculated as a percentage of the dry matter. The young growth had a uniformly lower calcium content than older leaves on the same shoot.

As the season advanced, trees lacking either magnesium or potassium showed a decrease in the total content per leaf of the deficient element in the lower leaves of the leader, the withdrawal probably being made in response to the requirements of the growing point of the shoot.

The appearance of magnesium-deficiency symptoms in Cox's Orange and Jonathan leaves was associated with a content of this element of less than 0.14 per cent. magnesium oxide, but could not be correlated with any particular percentage of the mineral in the leaf.

FOLSOM (D.). **Apple spraying with new fungicides.**—*Bull. Me agric. Exp. Sta.* 442, pp. 273-274, 1946.

The following five fungicides were tested for controlling apple scab [*Venturia inaequalis*: *R.A.M.*, xxv, p. 398]: dry lime-sulphur at 8 lb. per 100 gals. water; micronized sulphur at 10 lb. per 100 gals.; puratized N5-E at  $\frac{1}{20}$  gal. to 100 gals. (active ingredient 1: 20,000); dithane D-14 at 1.5 qts. to 100 gals. (1: 667) plus  $\frac{3}{4}$  lb. zinc sulphate and  $\frac{1}{2}$  lb. hydrated spray lime; and isothan Q-15 at  $\frac{1}{10}$  gal. to 100 gals. (1: 5,000). Dry lime-sulphur gave the best results in 1945; isothan Q-15, puratized N5-E, and micronized sulphur were of little use and dithane D-14 merely russeted the fruits and decreased their size.

HUTTON (K. E.). **Trunk and limb cankers of coastal Apple tree caused by *Dothiorella*.**—*Agric. Gaz. N.S.W.*, lviii, 2, pp. 92-94, 3 figs., 1947.

For some years a serious die-back of apple-trees [*R.A.M.*, xvii, p. 443; xix, p. 352] has caused loss to growers in the coastal regions of New South Wales. The

disease, caused by the fungus *Dothiorella* sp. [ibid., v, p. 279; xxiii, p. 253], shows three forms; (a) bark canker of limbs, (b) wood infection following pin-hole borer [*Scolytus* sp.] attack, and (c) trunk canker. The bark canker causes a leader and lateral die-back, especially in the Hills District. Brown lesions are formed which cause a spring collapse and the fungus, proceeding along the outer wood beyond the bark canker, produces black bands  $\frac{1}{8}$  to  $\frac{1}{4}$  in. wide. Then the bark canker turns from brown to black, the outer layer lifting and giving a ragged appearance. The small, black fruiting bodies appear four to five weeks after infection. The first sign of a wood infection following a borer attack is a brown colouring of the xylem tissue. The bark is blackened by a watery ooze from the tunnel entrance and a scurfy condition is sometimes found. The affected area has a papery appearance on drying. The fungus *Dothiorella* sp. can be isolated from brown to black streaks in the wood. There is a possibility that the borer is a vector of the *Dothiorella* and this is being investigated.

The trunk canker, which is very extensive on the McIntosh Red variety, occurs in the Oakdale district. Both the borer and a *Dothiorella* sp. are associated with this. The first sign, in mid-January, is a small, dark, wet area around the tunnel entrance. Dark streaks penetrate into the wood beyond the bark cankers. There is no control as yet for (b) and (c) but in the case of (a) diseased wood should be cut off to a distance of 18 in. to 2 ft. below the wood discoloration.

A serious die-back of apricot limbs accompanied by gumming occurs in the Richmond-Kurrojong area and the same association of borer and fungus has been found to be responsible.

THOMAS (H. EARL) & SCOTT (E. E.). **Arsenical injury, leaf spotting, and defoliation of Apple.**—*Mon. Bull. Calif. Dep. Agric.*, xxxvi, 1, pp. 37–38, 1 fig., 1947.

For the past 15 years there has been considerable spotting and defoliation of apple leaves in the Pajaro Valley of Santa Cruz. *Stemphylium congestum* [*R.A.M.*, x, p. 321; xxiv, p. 22] has been isolated frequently from spots. The authors conclude, however, after inoculation tests with *S. congestum* that the fungus causes only slight to moderate spotting and no defoliation and that arsenical sprays are the primary cause of both disorders, which are merely aggravated by *S. congestum*.

GOIDÀNICH (G.). **Un interessante tipo di butteratura parassitaria delle Mele.** [An interesting type of parasitic pitting of Apple.]—*R.C. Accad. Lincei*, Ser. VIII, i, 5, pp. 654–659, 3 figs., 1946.

In 1939, the author examined Calvilla Bianca apples from Verona affected by pitting. Small round spots were more or less regularly distributed over the surface, the tissue under them being brown and depressed. A fungus was isolated from affected material, inoculations with which into healthy apples gave positive results.

The pycnidia developed rapidly, emitting numerous hyaline, unicellular conidia, which, as they appeared, formed a mucous agglomeration round the ostiole. Other pycnidia arose from the chlamydospores [hypnocysts: *R.A.M.*, ix, p. 240 and below, p. 356]. These organs were usually multicellular, irregular in structure, mostly clavate, isolated or, more often, arranged in chains. The fungus is placed in the genus *Peyronellaea* recently erected by the author [loc. cit.] and is provisionally named *P. veronensis* n.sp.

MOORE (M. H.). **Bacterial canker and leaf spot of Plum and Cherry. A summary of present knowledge on control measures in Britain.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 57–62, 1947.

This paper has already been noticed from another source [*R.A.M.*, xxvi, p. 159].

TUZSON (J. v.). **Az Ószi barackfa *Agaricus melleus* okozta betegsége.** [On the Peach tree disease caused by *Agaricus melleus*.]—*Ann. hist.-nat. Mus. hung.*, Pars bot., xxxvi, pp. 132–136, 2 pl., 1943. [German summary. Received May, 1947.]

*Agaricus melleus* [*Armillaria mellea*] was found to be responsible for the dying-off of grafted peach trees [*R.A.M.*, xxiv, p. 25] observed annually in a large orchard at Érd, Hungary, on a recently cleared forest site where the fungus was already widespread and continued to thrive on the decaying roots, stumps, and other woody debris. Entry into the stems was gained through the juncture between scion and stock, which should preferably be located at a higher level to avoid any risk of contact with contaminated soil.

WEI (C. T.). **Notes on the storage and market diseases of fruits and vegetables. I. Market diseases of stone fruits.**—*Sinensia*, xii, 1–6, pp. 135–152, 11 figs., 1941. [Received March, 1947.]

Notes are given on diseases of stone fruits found in the Chengtu market in 1939–40. *Alternaria tenuis* was found as a weak wound parasite on fruits of peach, plum (*Prunus salicina*), and *P. mume* [Japanese apricot].

*Aspergillus luchuensis* [*R.A.M.*, xii, p. 397; xvii, p. 455] is described as having conidia spherical on peach, ovate to broadly oblong on *P. salicina* and *P. mume*, verrucose (peach), or coarsely echinulate (*P. salicina* and *P. mume*), measuring 3.2 to 4.5  $\mu$  in diameter in the peach strain, 4.2 to 7.7 by 3.9 to 5.6  $\mu$  in the *P. mume* strain, and 5.6 to 9.1 by 4.9 to 9.1  $\mu$  in the *P. salicina* strain. On ripe fruit of the honey-type peach (*P. persica*), the fungus caused a colonial, buff-coloured, soft but not watery rot, more or less round with a distinct and entire margin, developing rather rapidly. The disease was common and destructive. On *P. salicina* the affected area was Rood's brown, soft, Vandyke-brown at the distinct and entire margin, the rotten flesh being a deeper colour than the healthy; a white mould soon appeared, later turning black as the conidia formed. On *P. mume* the rot was clay-coloured to sayal-brown, very soft, circular with a distinct and entire margin, and very rapid; the infected flesh was clay-coloured. A white mycelial growth appeared at the centre and turned black, leaving a white, sterile margin, as the conidial heads developed. The fungus was common on fruit of *P. mume* and occasionally occurs on plum.

*A. versicolor* [ibid., xxiv, pp. 240, 381] attacked the ripe fruit of the honey-type peach, causing a light pinkish-cinnamon, soft, more or less round rot with a distinct and entire margin; the fructifications were olive-yellow, later zainette green. The rot was quite common on the ripe fruits, though less so than *A. niger*.

*Botrytis cinerea* caused heavy loss to apricot (*P. armeniaca* var. *ansu*) fruits, in one instance amounting to about 30 per cent., but less to peaches, though even with this host the loss in one case was over 10 per cent. Inoculations with the apricot strain infected peaches.

*Cephalothecium* [*Trichothecium*] *roseum* [cf. ibid., xxi, pp. 209, 531] caused up to 10 per cent. rot in very ripe, delicate fruits of honey-type peaches; the fungus is a weak parasite, and caused no rotting when inoculated into plums.

*Cladosporium carpophilum* [ibid., xxiv, p. 153] produced very numerous spots on single peaches, often with a pattern resembling that caused by raindrops running off, indicating that the spores were rain-borne. In nature the fungus also attacks apricot (var. *ansu*) and *P. mume* fruits. Infection was highest on peaches, over two-thirds of this fruit in the market being infected, in addition to those attacked in the orchard. Inoculations of wounded plums (*P. salicina*) gave positive results.

*Gliocladium mumicola* n.sp. caused rotting of *P. mume* fruits. In culture it produced a thin layer of white, downy fruiting structure, later snuff-brown, the reverse being cinnamon to clove brown. Aerial mycelium, at first lacking, was loose and sparse; the vegetative mycelium measured 2.8 to 4.2  $\mu$  in diameter, and the fertile mycelium, which was sometimes tinted with brown, 3 to 9.8  $\mu$ . The conidiophores, arising perpendicularly from cells of the fertile hyphae, were 67.2 to 382.4 by 6.2 to 12.9  $\mu$ ; metulae of one to two series, or sometimes none, 11.2 to 28.5 by 2.4 to 7  $\mu$ . The sterigmata, which formed a verticil on the conidiophore or occurred in a group of two to several on a metula, measured 7 to 14 by 2 to 3  $\mu$ . The chlamydospores formed irregular balls of 4 to 12 cells, 46.2 to 61.2 by 3.9 to 5.7  $\mu$ ; single cells, globose to subglobose or irregular as a result of crowding, thick-walled, contained numerous oil globules 12.6 to 29.4  $\mu$  across. On rotten fruit the elliptical to narrowly ovate or elongated-elliptic, hyaline, biguttulate conidia, arranged in chains, then forming a head with mucilaginous fluid, measured 5.6 to 14 by 2.8 to 5.6  $\mu$ . The species differs from *G. roseum* in the absence of a loose, floccose type of growth, its larger conidia, and the presence of chlamydospores.

*Gloeosporium amygdalinum* [ibid., xiv, p. 680] commonly produced rotting on ripe *P. mume* fruits.

*G. serotinum* attacked *P. armeniaca* var. *ansu*, peach, and *P. salicina*; cross-inoculations gave symptoms resembling those found in nature. The fungus is described as showing acervuli scattered over the diseased area, raised, pinkish on a very minute, blackish base, round to oblong, 81.9 to 207.9  $\mu$  in diameter, and without setae. The simple, rarely branched, hyaline conidiophores, in a palisade, measured 8.4 to 29.4 by 1.4 to 4.2  $\mu$ . The oblong, cylindrical, sometimes ovate, hyaline, continuous conidia showed a central refractive sphere and measured 7 to 16.8 by 2.8 to 6  $\mu$ .

*Physalospora piricola* [ibid., xv, p. 374] attacked *P. armeniaca* var. *ansu*, peach, and *P. salicina*. On cross-inoculation, all the strains produced rot typical of the host. The fungus is described as having innate, erumpent, conical to oblong pycnidia 359.6 to 713.4  $\mu$  in diameter by 429.2 to 823.6  $\mu$  high. It was never observed to mature on host tissue in the laboratory. On various media [the pycnidia] were up to 1 mm. or more in diameter. The simple, hyaline, continuous, rarely branched, filiform to subclavate, occasionally slightly geniculated conidiophores measured 12.6 to 40 by 2.5 by 4.9  $\mu$ . The hyaline, continuous, narrowly ovate or elliptic-fusiform conidia, sometimes cuneate at the base, measured 18.9 to 28 by 4.9 to 7  $\mu$ . In moist air or water they became up to 3-septate, produced one or two polar germ-tubes with occasional lateral ones, and often showed filiform, hyaline, aseptate paraphyses 14 to 44.8 by 2.5 to 4.9  $\mu$ .

*Penicillium chloroleucon* produced a soft, deep, olive-ochre to sayal-brown rot on plum, though not frequently on this host. Inoculations into honey-type peach gave a snuff-brown rot.

A species of *Phoma* caused rotting of damaged peaches. *Phomopsis amygdalina* [ibid., xv, p. 731] caused a soft, brown rot on apricots occasionally; on peaches it entered the fruit through the stem end, styler end, or a wound, producing a dry, wrinkled effect and sometimes causing considerable loss (10 to 30 per cent. being not uncommon) among later varieties; on plum, the fungus was not important.

On ripe peaches, *Rhizopus nigricans* [*R. stolonifer*: ibid., xxiii, p. 234] caused a snuff-brown rot; if the affected fruit was not promptly removed the fungus sometimes destroyed entire lots, especially among the honey-type peach.

*R. artocarpi* [ibid., xxii, p. 53] (which the author considers to be only a variant of *R. stolonifer* on peaches) caused a rot similar to that produced by the latter. When inoculated into plum, a rot developed which covered four-fifths of the fruit in three days. *Sclerotinia laxa* caused rotting of apricot and peach, and (when inoculated experimentally) of plum.

KRONENBERG (HESTER G.). **Autoreferaat van de voordracht voor de Ned. Plantenziektenkundige Vereeniging op 28 Nov. 1942 te Amsterdam. Virusziekten in Aardbeien.** [Author's abstract of the lecture to the Dutch Phytopathological Society on 28th November, 1942, at Amsterdam. Virus diseases in Strawberries.]—*Tijdschr. PlZiekt.*, xlix, 2, pp. 74–76, 1943. [Received November, 1946.]

Brief descriptions are given of three virus diseases of strawberries in Holland, the symptoms of which correspond with those of yellow edge, crinkle, and witches' broom. The results of preliminary transmission experiments, using R. V. Harris's stolon-grafting method [*R.A.M.*, xii, p. 519], left no doubt as to the presence in the country of the crinkle virus, which was harboured by the three strawberry varieties included in the tests, viz., Jucunda, Oberschlesien, and Frau Mieke Schindler. An objection to the use of the wild strawberry (*Fragaria vesca*) as an indicator plant is its strong reaction to the crinkle virus, which tends to inhibit the expression of other virus symptoms: it should be supplemented in future trials by a somewhat less susceptible variety, such as Deutsch Evern. Symptoms of yellow edge are conspicuous in the Deutsch Evern variety and sporadic cases of witches' broom occur regularly.

CISNEROS (R. S.). **El tizón de la Frutilla en la República Argentina.** [Strawberry blight in the Argentine Republic.]—*Publ. tec. Dir. Agric., B. Aires*, iii, 4, 16 pp., 1 pl., 2 figs., 1946.

The presence of the strawberry leaf blight caused by *Dendrophoma obscurans* [*R.A.M.*, iv, p. 335; xxiv, p. 423, *et passim*] was first recognized in Argentina (Province of Buenos Aires) in 1944. The symptomatology and morphological and cultural characters of the fungus are described and directions are given for its control based on experience in the United States; the geographical distribution of the disease in the latter country is indicated. *D. obscurans* was readily isolated in pure culture on standard media, of which rolled oats and 2 per cent. dextrose agar were the best, the spores germinating in 2 to 7 days at 25° C. The incubation period of the pathogen in the author's experiments was 20 days as against ten reported by other workers, the discrepancy being presumably due to differing environmental conditions.

MCDONALD (J. E.) & FUDGE (J. F.). **Commercial insecticides and fungicides in Texas 1945–1946.**—*Circ. agric. Coll. Tex.* 112, 13 pp. 1946.

This is the fourth annual report [cf. *R.A.M.*, xxv, p. 351] required by the Texas Insecticide and Fungicide Law setting forth colouring, branding, and labelling requirements, and analyses of 61 agricultural insecticides and fungicides made during the year.

MCCALLAN (S. E. A.). **Dithiocarbamate fungicides.**—*Agric. Chemicals*, i, 7, pp. 15–18, 55, 2 figs., 1946.

In this paper the author presents a succinct account of the present state of knowledge concerning the physical, chemical, and fungicidal properties of the group of organic materials derived from dithiocarbamic acid: tetramethylthiurum disulphide, known as thiosan, tersan, arasan, nomersan, and T.M.T.D.; ferric dimethyl dithiocarbamate, known as fermate; zinc dimethyl dithiocarbamate, known as methasan, zerlate, or milban; and disodium ethylene bisdithiocarbamate, known as dithane.

In the control of the turf diseases brown patch [*Corticium solani*] and dollar spot [*Sclerotinia homoeocarpa*] the wettable form, thiosan, has given results comparable with those secured from the organic mercury treatments [*R.A.M.*, xxiv, p. 105].

The same material in dust form (arasan) is used to increase the stand of groundnuts [ibid., xxiv, p. 269; xxv, p. 332]. This dust has been proved to have an important place in vegetable seed treatments [ibid., xxv, p. 379]. For the general control of seed decay and damping-off, arasan is probably the best seed treatment for beet [ibid., xxiv, p. 405], sweet corn [maize], and tomato, and among the best for carrot, cucumber [ibid., xxiii, p. 508] and *Cucurbita* spp., spinach [ibid., xxv, p. 591], and Swiss chard [*Beta vulgaris* var. *cicla*]. It is also good on cabbage and other cruciferous seed. On onion seed arasan plus sticker has given damping-off control equal to that of standard formaldehyde solution, in addition to being much less laborious.

With legume seeds arasan gives control about equal to that of the organic mercury fungicides, but it is generally surpassed by spergon. A striking advantage of arasan is that it is less injurious to seed than the organic mercury treatments and the treated seed can be stored for long periods without injury from the chemical. Limited trials with maize indicate that arasan and spergon may equal the standard organic mercury treatments [ibid., xxv, pp. 391, 556].

As an apple spray [ibid., xxv, pp. 384, 402; xxvi, p. 97] fermate has proved very effective and is compatible with lead arsenate, lime, summer oils, and DDT. It appears to reduce the tendency of lead arsenate to cause russetting. Fermate controls scab [*Venturia inaequalis*: loc. cit.] fairly well, though surpassed in this respect by the new phenylmercuritriethanol ammonium lactate [ibid., xxvi, p. 67] fungicides. It is outstanding against rust [*Gymnosporangium juniperi-virginianae*: ibid., xxiv, p. 265; xxv, p. 402], and has controlled blotch [*Phyllosticta solitaria*], bitter rot [*Glomerella cingulata*], and frog-eye leaf spot [*Physalospora obtusa*; see above, p. 333] as well as, or better than, Bordeaux mixture. An objectionable feature of fermate, however, is its black residue. Fermate has also controlled pear scab [*V. pirina*: ibid., xxv, p. 69] on sulphur-sensitive varieties without causing fruit-russetting. Against cranberry fruit rots [*G. cingulata* var. *vaccinii* and other fungi: ibid., xxv, p. 171], fermate has given much better control than Bordeaux mixture. It also controls carnation rust [*Uromyces caryophyllinus*: ibid., xxiii, p. 236].

In general, it appears that dithane plus zinc sulphate and lime is superior to the fixed copper fungicides and to the other new organic preparations used against late and early blights of potato [*Phytophthora infestans* and *Alternaria solani*, respectively: ibid., xxiv, p. 69; xxv, p. 415], though Bordeaux mixture is as good or better against *P. infestans*. Against both diseases, zerlate is superior to fermate [ibid., xxvi, p. 166]. Dithane plus zinc sulphate and lime and the zinc dimethyl dithiocarbamate control tomato early blight [*A. solani*], while zerlate, dithane plus zinc sulphur-lime, and fermate control celery blights [*Cercospora apii* and *Septoria apii*: ibid., xxiv, p. 262] at least as effectively as the best copper sprays. The control of tobacco blue mould [*Peronospora tabacina*: ibid., xxv, pp. 237; xxvi, p. 134] has been much simplified by the use of fermate.

**FRENCH (O. C.). New equipment for agricultural pest control.**—*Agric. Chemicals*, i, 8, pp. 15–19, 51, 13 figs., 1946.

Brief descriptions are given of some types of equipment now in use in the United States for the control of agricultural pests. Before the war, increased use was being made of mobile sprayers, the operators riding on platforms or in elevated towers. This method reduced the number of men required and accelerated the spraying operations. During the war, the shortage of labour impelled many operators to build automatic vertical booms for their large sprayers [cf. *R.A.M.*, xxv, p. 71], the demand for this type of equipment coming particularly from walnut- and citrus-growers. At present there is no standard design for these booms.

The use of concentrated liquid sprayers employing a large-volume air stream

for atomizing and conveying the spray has greatly increased recently. For tree crops, the equipment usually consists of a blower which discharges 8,000 to 10,000 cu. ft. of air per min. through a fish-tail nozzle at 120 to 150 m.p.h. Liquid is introduced by nozzles or orifices in a small tube along the length of the fish-tail at its outlet. The spray material is concentrated so that 10 to 30 gals. per acre applied to trees of normal size is comparable to 3 to 6 gals. per tree of standard dilute sprays. The advantages of this type of sprayer are that it is lighter than the standard sprayer, less time is lost in refilling, only one operator is required, and the machine can also be used for dusting. It is used by some growers for the complete spray schedule on almonds, apricots, peaches, and plums, and, to a limited extent, on pears; similar equipment has been used on vines for many years.

Speed sprayers [ibid., xxv, p. 254] now provide for the air blast to be directed outwards at 90° from the fan shaft axis and throughout 240° of a circle. There is no provision for altering the direction of the air stream. One Californian grower who has used speed sprayers for the past two seasons claims that his total spraying costs are less than half of what they were when he used high-pressure sprayers with hand-operated nozzles. Each machine can spray at the rate of 2,500 gals. per hour over a ten-hour day. The demand for aeroplane spraying is increasing.

Dusting equipment is also undergoing re-design. As dusters increase in number and size, growers are faced with the difficulty of confining poisonous dusts to the crops being treated. This problem is causing research workers to pay more attention to concentrated liquid sprays and combination dusters which apply a finely atomized liquid simultaneously with the dust in order to prevent drifting and to increase the dust deposit on the plant surfaces. Dusters, like sprayers, should be 'one man'-operated if possible. In general, this requirement has been met except for machines dusting very large trees, for which two operators are usually required in addition to a driver.

Vineyard dusting now demands equipment to handle several materials besides sulphur. A large-volume, low-velocity type fan, similar to the citrus duster, but smaller, has been developed to meet this need. These machines are mounted on a chassis with reduced wheelbase and tread in order to pass between the rows without injuring the vines. Truck crop dusters should be integrally mounted on a tractor unit, trailed equipment being too unwieldy.

MARCHIONATTO (J. B.). **La micología en la República Argentina.** [Mycology in the Argentine Republic.]—*An. Soc. cient. argent.*, cxliii, 1, pp. 14–20, 1 fig., 1947.

The commemoration of the 75th anniversary of the foundation of the Argentine Scientific Society prompted this epitome of outstanding landmarks in the history of mycology in the Republic [cf. *R.A.M.*, xxv, p. 403], beginning with the discovery by Commerson in 1767 of the valuable edible fungus, *Cyttaria darwini* [ibid., xxi, p. 507]. During the nineteenth century several important mycological collections were made in the course of scientific expeditions to the Antarctic, and in 1881 Spegazzini paid his first visit to Tierra del Fuego and inaugurated his long series of contributions, covering nearly half a century, to the knowledge of fungi, not only in Argentina but in the South American continent as a whole. In 1879, when Spegazzini arrived in Argentina, a bare 39 fungi had been recognized in the country, while to-day the number of known species exceeds 5,000. Among others devoting themselves to the study of various groups of Argentine fungi may be mentioned Thaxter (Laboulbeniales, 1906), and Hennings (1894), Dietel and Neger (1899), Arthur (1925), and Jackson (1926–32), all concerned with the Uredinales, while various aspects of mycology are still engaging the attention of contemporary workers.

The repercussions of the mycological studies on other sciences in Argentina are briefly discussed.

STAKMAN (E. C.). **International problems in plant disease control.**—*Proc. Amer. phil. Soc.*, xci, 1, pp. 95–111, 8 figs., 3 graphs, 6 maps, 1947.

In this paper, read at Philadelphia on 22nd October, 1946, in the symposium of the National Academy of Sciences on present trends and international implications of science, the author pleads for international co-operation in the control of plant diseases, with special reference to stem [black] rust of cereals (*Puccinia graminis*). Other diseases of major importance for which similar treatment is claimed include chestnut blight (*Endothia parasitica*), potato blight (*Phytophthora infestans*), the vine powdery and downy mildews (*Uncinula necator* and *Plasmopara viticola*), downy mildew of hops (*Pseudoperonospora humuli*), flax rust (*Melampsora lini*), wheat bunt (*Tilletia tritici*) [*T. caries*], and many others. Most of the papers listed in the bibliography of 56 titles have been noticed from time to time in this *Review*.

SNEEP (J.). **De biochemie van parasitisme.** [The biochemistry of parasitism.]—*Tijdschr. PlZiekt.*, lii, 5–6, pp. 125–137, 1 pl., 1946. [English summary.]

Neither *Nematospora phaseoli* [*R.A.M.*, xxiii, p. 207] nor *Phycomyces blakesleeianus* [cf. *ibid.*, xxv, p. 518] made any growth in a nutrient solution devoid of 'ergones' (the term used by Von Euler for 'growth substances' in 'Ergebnisse der Vitamin- und Hormonforschung', i, pp. 159–190, 1938). However, when the two organisms were transferred jointly to a similar medium, both grew and *P. blakesleeianus* formed sporangiophores. The latter utilizes the vitamin B<sub>1</sub> synthesized by *N. phaseoli*, which in its turn assimilates the biotin furnished by *P. blakesleeianus*.

As a working hypothesis to explain various types and manifestations of parasitism, e.g., biotrophic and perthotrophic parasitism, specialization of pathogens, hypertrophic development of parasitized tissues, and virus development in plants, it is assumed that the metabolic system of the host plant is complete and that of the biotrophic parasite incomplete, the latter being supplemented by growth substances derived from the host. Conversely, the metabolic system of the host is influenced by the pathogen.

BRIAN (P. W.). **Production of gliotoxin by *Penicillium terlikowskii* Zal.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 211–218, 1946.

Studies are described on strains of *Penicillium* isolated from Wareham Heath soil [*R.A.M.*, xxvi, p. 117 and cf. next abstract], which were found to produce gliotoxin [*ibid.*, xxv, p. 571]. Some of the strains were at first identified as *P. jensenii* [*ibid.*, xxiv, p. 333], but two of them have now been tentatively identified by Dr. K. B. Raper, of the United States Department of Agriculture, as *P. terlikowskii*, to which the fungus previously named *P. jensenii* is accordingly referred in this paper.

Assays of fungistatic activity were made by a serial dilution spore germination test on conidia of *Botrytis allii*. Culture filtrates from Raulin-Thom and Weindling media displayed greater fungistatic activity than those from Czapek-Dox or a maize steep medium. With the Weindling medium it was found possible to use a wide variety of carbon sources, while ammonium, peptone, and nitrate nitrogen were suitable as nitrogen sources. The initial pH value of the medium should be over 4. An unidentified impurity in a crude grade of glucose used in certain media increased sporulation and stimulated greatly the development of fungistatic activity in the culture filtrates. This result was not, apparently, associated with various minor elements, calcium, various vitamins, peptone, or yeast extract. The strains showed much variation in their ability to produce gliotoxin, one common sterile variant producing little, if any. It was apparent that the purely mycelial forms are worthless for gliotoxin production, while the conidial forms are outstandingly superior in this respect.

MCGOWAN (J. C.). **The chemistry of fungal antibiotics in relation to soil microbiology.**—*Chem. & Indust.*, 1947, 16, pp. 205–207, 1947.

This is a brief discussion of 39 contributions to the literature on the chemistry of fungal antibiotics in relation to soil microbiology, with special reference to the Wareham Heath mycorrhizal problem [cf. preceding abstract.]

WIKÉN (T.) & ÖBLOM (KARIN). **Examination of extracts from sporophores of Swedish Hymenomycetes for antibiotic activity against *Staphylococcus aureus*.**—Reprinted from *Ark. Bot.*, xxxiii A, 11, 14 pp., 1946.

The sporophore extracts of 24 out of 57 Swedish Hymenomycetes contained antibiotic principles effective against *Staphylococcus aureus* [*R.A.M.*, xxv, p. 519], and of these 11 gave measurable zones of growth inhibition outside the cylinders of the assay plates, namely, *Cantharellus tubaeformis*, *Clitocybe clavipes*, *C. inversa*, *Cortinarius turmalis*, *Craterellus lutescens*, *Flammula penetrans*, *Hydnum repandum*, *Lactarius repraesentaneus*, *Omphalia maura*, *Russula sardonia*, and *Tricholoma saponaceum*. The antibiotic activity of the extracts from *F. penetrans* withstood 15 minutes' autoclaving at a pressure of 1 kg. per c.c., corresponding to a temperature of 120° C., but that of the other ten species listed above was more or less reduced by the treatment.

HAYES (L. E.). **Survey of higher plants for presence of antibacterial substances.**—*Bot. Gaz.*, cviii, 3, pp. 409–414, 1947.

Of 231 species of higher plants of which the aqueous extracts were tested for inhibitory activity towards *Staphylococcus aureus*, *Escherichia* [*Bacterium*] *coli*, *Erwinia carotovora*, and *Phytomonas* [*Bact.*] *tumefaciens*, 18 proved to be of some interest in this respect. For instance, the growth of *E. carotovora* was markedly suppressed (inhibitory zone of 16 to 25 mm.) by extracts of *Allium tricoccum* leaves, *Convolvulus arvensis* leaves, stems, and roots, and *Taxus canadensis* fruits (including fruits boiled for five minutes). The inhibitory zones formed in *E. carotovora* cultures as a result of contact with the extracts of *A. vineale* leaves, *Ilex decidua* fruits, and *Ranunculus abortivus* (except the roots) measured 11 to 15 mm., and slighter antagonistic effects were exerted by a number of others. In the case of *Bact. tumefaciens*, *A. tricoccum* leaves and *A. vineale* bulbs produced inhibitory zones of 16 to 25 mm., while *A. cernuum* and *A. vineale* leaves fell into the next category of 11 to 15, and the third (6 to 10 mm.) was occupied by *A. cernuum* bulbs, *Barbarea vulgaris* winter rosette, *C. arvensis* roots, and entire plants of *Lepidium draba*.

LUCAS (E. H.), LEWIS (R. W.), & SELL (H. M.). **An antibiotic principle derived from seeds of *Brassica oleracea*.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxix, 1, pp. 4–6, 1946.

In the course of exploratory studies of plant materials, a principle antagonistic to a number of bacteria, including *Phytomonas* [*Xanthomonas*] *phaseoli*, and the fungi, *Fusarium* [*bulbigenum* var.] *lycopersici*, *Alternaria solani*, *Penicillium expansum*, and *Sclerotinia fructicola*, was detected in cabbage seed extracts [see preceding abstract].

RIGOT (N.). **Étude des symptômes de l'enroulement primaire : influence de la fumure sur leurs manifestations. Transmission de la maladie.** [Study of the symptoms of primary leaf roll; influence of manure on their manifestation. Transmission of the disease.]—*Parasitica*, ii, 4, pp. 139–140, 1946.

This study of the appearance of primary leaf roll due to potato leaf roll virus [*R.A.M.*, xxiv, p. 471] in the progeny of infected plants was made at Orgéo, Belgium, by means of microscopic examination of the stems. Manure rich in nitrogen tended

to hide the symptoms of primary leaf roll, but those containing phosphorus and potassium accentuated them. The virus is transmitted quite regularly to the progeny and it is only in cases of slight infection among certain varieties that the symptoms cannot be detected immediately and these plants invariably show secondary leaf roll.

ROZENDAAL (A.). **Virusziekten van Aardappelplanten.** [Virus diseases of Potato plants.]—*Landbouwk. Tijdschr.*, lviii, pp. 533–543, 1946.

Following an outline of the history of potato viruses and of the methods adopted by various workers for their classification, the writer summarizes the present status of these pathogens in Holland, where two groups may be distinguished for practical purposes, namely, I, the leaf roll virus, and II, comprising A (corresponding to Quanjer's common mosaic virus), X (Quanjer's top-necrosis virus), Y (not absolutely identical with acropetal necrosis [*R.A.M.*, x, p. 746] but in all probability closely related to it), and F and G [potato aucuba mosaic virus] (Quanjer's aucuba mosaic).

ANDRÉN (F.). **Besprutningsförsök mot Potatisbladmögel 1946.** [Spraying experiments against Potato late blight in 1946.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, 1946, 5, pp. 73–78, 1946.

During the summer of 1946, when potato late blight [*Phytophthora infestans*] was rife throughout Sweden, the following fungicidal sprays were tested against the disease [*R.A.M.*, xxv, p. 574] on the Magnum Bonum variety: ordinary 2 per cent. Bordeaux mixture; 2 per cent. Bordeaux prepared with kronkalk special (a calcium hydroxide manufactured by A. B. Karta Oaxen); the copper oxychlorides, cuzol (2 per cent.), kopsit (1 per cent.), soltosan (0.5 per cent.), viricuvire (0.5 per cent.), and usit (1.5 per cent.); the copper oxides, Sandoz (0.4 per cent.), Maag (0.5 per cent.), and perenox (0.5 per cent.); and dithane (in one series only). In two tests in one locality the incidence of blight, assessed by the usual 10-grade scale, in the treated plots on 25th September, ranged from 0.2 for the two brands of Bordeaux to 4.3 for usit and 6.9 for dithane, the figure for the unsprayed plot being 9.5. The average yields in the plots treated with Bordeaux, copper oxychloride, and copper oxide were 200, 184, and 173 dt [= 100 kg.] per ha., respectively, compared with 154 in the untreated. In another two tests in a different locality on 12th September the minimum percentage of infection (1.2) was in the plot sprayed with Bordeaux kronkalk and the maximum of 2.5 in the two treated with usit and cuzol, the control figure being 6.5. Plots treated with Bordeaux, copper oxychloride, and copper oxide yielded 168, 185, and 165 dt. per ha., respectively, compared with 160 for the untreated.

In a parallel experiment, in which the copper contents (reckoned as metal) of the copper oxychlorides and copper oxides were equalized with that of Bordeaux mixture, the incidence of blight on 25th September in no case exceeded 0.6, and the preparations represented in both these groups must be regarded as completely reliable for the control of the disease if properly applied. The yields in the Bordeaux-, copper oxychloride-, and copper oxide-treated plots were 150, 157, and 140 dt. per ha., respectively, as against 119 in the unsprayed.

ROLAND (G.). **La sensibilité de diverses variétés de Pomme de Terre à l'attaque de *Phytophthora infestans* (Mont.) de Bary.** [The susceptibility of different varieties of Potato to attack by *Phytophthora infestans* (Mont.) de Bary.—*Parasitica*, ii, 4, pp. 121–123, 1946.

During potato variety trials in 1946 in the region of Gembloux, Belgium, where a severe attack of *Phytophthora infestans* occurred [*R.A.M.*, xxv, p. 137], only one variety, Aquila, was resistant; Ackersegen and Prisca were slightly susceptible;

the other varieties inspected are classified according to their susceptibility. The results agree with those of other workers in Holland and Germany except for the *Libertas* and *Noordeling* varieties, which appear to be more resistant in Holland than in Belgium. The agreement in varietal susceptibility in Belgium, Holland, and Germany indicates that the virulence of *P. infestans* is almost equal in these countries.

HOLMBERG (C.). **Potatiskräften och Potatisål i Sverige år 1946.** [Potato wart and Potato eelworm in Sweden in the year 1946].—*Värtskyddsnotiser, Växtskyddsanst., Stockh., 1947*, 1, pp. 5–9, 1 fig., 1 map, 1947.

During 1946, 180 fresh cases of potato wart [*Synchytrium endobioticum*] were recorded for the whole of Sweden [cf. *R.A.M.*, xxv, p. 521], the maximum for the past ten years. In 27 out of the 61 affected parishes the disease was observed for the first time. As in previous years, the fungus was most prevalent in the southern part of the country, notably in the vicinity of Kristianstad, where 222 new foci of infection were noted during the past five years, as against only 105 from 1928 to 1941, bringing the total at the end of 1946 to 327. Similarly in the Malmöhus district, where only 13 cases were reported between 1928 and 1941, the total by the end of 1946 had reached 72. Further experiments to determine the longevity of the pathogen in the soil [loc. cit.] pointed to an average of 15 years even under favourable conditions for the host, i.e., presupposing the annual intensive cultivation of immune varieties on the infested ground: otherwise a considerably longer period must be allowed.

SMITH (M. A.) & RAMSEY (G. B.). **Bacterial lenticel infection of early Potatoes.**—*Phytopathology*, xxxvii, 4, pp. 225–242, 2 figs., 1947.

Bacteria were isolated from the discoloured rotting lenticels of potato tubers arriving at the Chicago Produce Terminal from the principal States growing early crops, and compared with each other and with organisms emanating from the soil round the tubers and from the various types of soft rot following wounds or heat injury (scald) commonly affecting market potatoes. The lenticel bacteria were shown to resemble the agent of soft rot (*Erwinia carotovora*) [*R.A.M.*, xxvi, p. 124] and to be equally pathogenic.

Wound inoculations with cultures of lenticel bacteria resulted in the development of decay under the same conditions as favour soft rot by *E. carotovora*. Lenticel infections were readily obtained in freshly harvested tubers by immersion for a minute or longer in aqueous suspensions of bacteria from the same organs. Under controlled temperature and humidity conditions artificial inoculations did not cause lenticel decay at 61° or 72° F. at a relative humidity below 94·8 per cent., but at and above 98·2 per cent. infection occurred at both temperatures, being more rapid at the higher one.

The histological examination of naturally and artificially infected lenticels in various stages of decay disclosed suberized parenchyma cells in the infected area. Beneath this a new periderm layer, similar to that following mechanical injuries, was formed under the lesions in which the rotting was stationary.

A study of 66 bacterial isolates from lenticels, soil, and various kinds of soft-rot lesions revealed no morphological differences between them and only minor disparities in their biochemical and physiological characters. The pathogenic isolates are regarded as strains of *E. carotovora*.

TYNER (L. E.). **Studies on ring-rot of Potatoes caused by *Corynebacterium sepe-donicum*.**—*Sci. Agric.*, pp. 81–85, 1947.

The author states that efforts to control bacterial ring rot of potatoes are concerned mainly with the prevention of the viable cells of *Corynebacterium sepe-doni-*

*cum* [R.A.M., xxvi, p. 211] from coming in contact with the seed pieces before planting. It is suspected that plants are sometimes infected while growing, either by way of the roots or by insect transmission to the vines. Regarding the latter means Kreutzer and McLean [ibid., xxii, p. 404] found that the spread of the bacteria in the plants is too slow for transference by insects to be effective in promoting the disease. Investigations were made, therefore, into the possibility of spread by means of the root system and by other methods.

Young plants after 20 days' growth in sand were washed out, the sets removed, transplanted to pots containing an aqueous nutrient solution for 20 days, and finally planted out in the field after the roots had been dipped in a suspension of *C. sepedonicum*. There were four series, (1) root tips only dipped, (2) root tips wounded and dipped, (3) the lower two-thirds of the root system dipped, (4) non-treated controls; there were 20 plants in each treatment. At digging time eleven of the first set were diseased, eight were healthy, and one dead; of the second eleven were diseased, two healthy, and seven dead; of those with wounded roots, 18 were diseased and one dead, and all 20 untreated plants were healthy. Therefore, it appears that potato plants are readily infected by *C. sepedonicum* through the roots, wounding of the roots increasing their susceptibility.

No infection resulted in potatoes planted in spring in contact with overwintered ring rot-infested plant material or soil [cf. ibid., xxiii, p. 119]. The roots of five rows of potato plants of which one row was planted with diseased sets were exposed by means of ditches to irrigation water in August. All tubers from the infected plants had developed the disease by late September but no infection was present on the healthy plants.

In September, 1943, two strips of iron comparable to the blade of a large cutting knife were contaminated by passing through ring rot tubers. In May, 1944, after storage in an unheated shed one was used to cut 20 healthy tubers before planting. In May, 1945, 25 sets were cut with the other infected strip. Of the 1944 plants two became infected; the 1945 plants were all healthy.

Sterilized pieces, 1 ft. sq., of a jute sack were treated with 1 ml. of an aqueous suspension of *C. sepedonicum* in flasks which were kept at various temperatures (47° to 68° C.) and for various times (2 to 16 hours). The pieces were then soaked for two hours in 100 ml. sterile water, and samples tested on a suitable liquid medium. It was found that bacteria were present in the unheated but had evidently been killed on the heated pieces. Jute sacking with marked areas which had been soaked in a suspension of *C. sepedonicum* was heated at 50° for 3½ to 5 hours. The areas were tested by rubbing freshly cut sets of Carter's Early Favourite potatoes over the surface and observing infection development in the plants from them. The results confirmed the conclusion of the previous experiment that the bacteria are killed by heating.

**JONES (J. O.). Field methods for the diagnosis of mineral deficiencies in crop plants.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 18–22, 1947.

A brief, popular account is given of field methods for the diagnosis of mineral deficiencies in crop plants, including visual methods, the use of indicator plants, foliage spraying, injection, and the tissue test method [R.A.M., xxiv, p. 287; xxv, p. 576].

**WALLACE (T.). Mineral deficiencies in fruit and vegetable crops.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 3–9, 1947.

After referring to the history of the study of mineral deficiencies in plants [R.A.M., xxvi, p. 125], the author lists the mineral elements concerned and shows in what respects deficiency in them affects different crops. Mention is also made of methods of diagnosis and control, and there is a list of 11 references.

PLANT (W.). **A survey of trace elements and magnesium deficiencies of crops in some counties of England.**—*Occ. Publ. hort. Educ. Ass.* 5, pp. 23–26, 1947.

After giving a brief report of the occurrence of trace element deficiencies observed in crops from 1942 to 1945 in certain parts of England, the author concludes that climate affects the incidence of boron and manganese deficiency; rainfall is not, apparently, the predisposing cause of seasonal variations, but droughts at critical periods in the growth of a crop probably induce conditions that may lead to shortages. Manganese deficiency is also more pronounced where field drainage is poor. Certain classes of soils develop manganese and boron deficiency when unsuitably managed or too heavily limed. Glasshouse soils are liable to show magnesium deficiency for this reason.

STEVENSON (E. C.). **The effect of seedling diseases of Castor Beans on the subsequent plant development and yield.**—*Phytopathology*, xxxvii, 3, pp. 184–188, 2 figs., 1947.

At the Plant Industry Station, Beltsville, Maryland, seedling infections by *Alternaria ricini* [*R.A.M.*, xxiv, p. 386], *Fusarium* spp., and various Mucorales, responsible primarily for damage to the cotyledons of castor-bean [*Ricinus communis*] plants exerted a very deleterious action on subsequent growth and yield even in cases of recovery. The height and general vigour of the diseased seedlings were reduced and their maturity retarded, these effects being reflected, during the two years (1943–4) covered by the investigation, in a serious decline in yield, which amounted (in an average of four replications and combining the three varieties, Conner, Kentucky 38, and Doughty 11) to 870 lb. per acre compared with 1,098 in the healthy control plots. The quality of the seed, on the other hand, did not seem to be impaired by the diseases, no significant reductions having been recorded either in the hulling percentage or bushel weight.

ASTHANA (R. P.) & MAHMUD (K. A.). **Cercospora leaf-spot on Piper longum Linn.**—*Mag. agric. Coll. Nagpur*, xxi, 3–4, pp. 58–59, 1947.

From October, 1945 to March, 1946, leaf spots (*Cercospora* sp.) caused considerable damage at Nagpur on long pepper (*Piper longum*). Yellow specks appeared on the upper surface of the leaves and rapidly changed to round, chocolate-coloured spots from 5 mm. to 1 cm. in diameter. After six or seven days these turned whitish-grey in colour and developed a yellow ring around them which eventually spread to cover the whole leaf. The disease occurs most frequently in damp and shady localities. The host cells are invaded by fine hyphae, developing into typically branched haustoria, from the hyaline to brown mycelium. Subhyaline to yellowish-brown conidiophores, having one or more geniculations near the apex, emerge singly or in clusters from small stomatic cushions, are usually non-septate or occasionally 1- to 3-septate near the base, and measure 2.09 to 5.59 (3.18) by 12.72 to 47.7 (21.62)  $\mu$ . The straight or slightly curved conidia are mostly hyaline, pale yellow to olivaceous, obclavate to cylindrical, usually 3- to 4- (range 1- to 8-) septate, and measure 25.44 to 76.32 (50.88) by 0.95 to 3.49 (2.16)  $\mu$ . They germinate readily in tap-water, putting forth one or more germ-tubes mostly from the apical cells. Inoculations of host leaves with conidial suspensions produced infection within 4 to 10 days, the germ-tubes entering through the stomata. Other inoculations using four varieties of *P. betle* and several *Cercospora* hosts were all negative. *P. longum* was inoculated with several *C. spp.* also with negative results. It is believed that this disease has not hitherto been reported on *P. longum* and the causal organism differs from other *C. spp.* in having typically branched haustoria. It is named *Cercospora piperata* n.sp. [without a Latin diagnosis] and is being investigated further.

THIRUMALACHAR (M. J.). **A cytological study on *Uromyces aloës*.**—*Bot. Gaz.*, cviii, 2, pp. 245–254, 25 figs., 1946.

The author's cytological study of *Uromyces aloës* [*R.A.M.*, xix, p. 542] which occurs on *Aloë vera* and *A. spicata* in India was carried out on material of the former species from Mysore in continuation of Ajrekar and Tonapy's investigations, on the morphological and cultural characters of the rust (*J. Indian bot. Soc.*, iii, pp. 267–269, 1923). The subepidermal pycnidia and teleutosori (the former often abortive) are produced on the leaves. The teleutospores germinate freely, giving rise to bi-, occasionally tricellular promycelia, the bi- or trinucleate, fertile terminal cell of which extrudes an infection hypha for the penetration of the host, thereby fulfilling the function of the apparently absent basidiospores. The haploid chromosome number, determined in the course of the meiotic divisions of the fusion nucleus in the promycelium, is six.

SLOOFF (W. C.), THUNG (T. H.), & REITSMA (J.). **Leaf diseases of Sereh (*Andropogon nardus* L.). 1. Banded sclerotial disease, caused by *Rhizoctonia grisea* (Stevens) Matz.**—*Chron. Natur.*, ciii, 1–2, pp. 6–9, 3 figs., 1947.

*Andropogon nardus* plants near Buitenzorg, Java, sustained severe damage from a leaf blight characterized by the development over half or the whole of the lamina of transverse, straw-coloured bands of necrotic tissue, separated in acute cases only by narrow, irregular, purplish-grey zones, the most striking symptom of the disease. The discrete blotches appearing on the leaves in milder forms of infection may coalesce and leave green islands of variable shape. The newly invaded tissues are dirty green, slightly water-soaked, separated from the dead areas by a narrow, orange margin and from the healthy ones by a thin, irregular, dark green zone. A silky mycelium arises from the necrotic tissues and spreads over the healthy portions of the lamina. Primary infection may originate on any part of the leaf, but has most commonly been observed in the centre. Under humid conditions it expands rapidly, passing from one leaf to another but sparing the stalks. When the entire width of the leaf is covered, including the main vein, the water supply to the apical region becomes disorganized, resulting in the desiccation and curling-up of the blade.

On Thaxter's agar the feathery, profusely branching, and anastomosing mycelium, composed of hyphae 7 to 8.4  $\mu$  in diameter, gradually turns faintly violet-brown except for the fluffy, white, later grey or buff to brown clumps giving rise to the velvety sclerotia, which develop within a week at 25° to 30° C., measure 1.2 to 2.8 mm. in diameter or 5 by 2 mm. when coalescent, and on sectioning display a typical pseudoparenchymatous structure with a very dark or nearly black centre and a brown peripheral layer. On maize meal agar only a few sclerotia are produced measuring 5 mm. in diameter. From these characters the fungus on *A. nardus* was identified with the sugar-cane parasite, *Rhizoctonia grisea* (Stevens) Matz [*R.A.M.*, i, p. 274], while marked similarities to *Corticium sasakii* [ibid., xiv, p. 795 *et passim*] were also observed. The perfect state of the sereh fungus has not hitherto been found in nature, but it developed in the presence of moisture in a three-week-old maize meal culture, producing basidia, sterigmata (5 to 12 by 1.7 to 2.5  $\mu$ ), and basidiospores (5.5 to 8.5 by 5.5  $\mu$ ). These measurements agree with those of *C. sasakii*.

Positive results were given by inoculation experiments on *A. nardus* (8 out of 12 plants), the dissemination of the pathogen being noticeably stimulated by the presence of moisture on the leaves. Rice and banana leaves and sesame stalks were also attacked. These data confirm Wakker and Went's assertion (De ziekten van het suikerriet op Java . . .) that the parasite can spread from plant to plant over the surface of the water, and Sawada's observations (Descriptive catalogue

of the Formosan fungi Part I, 1919) as to its host range. Other contributions to the relevant literature are briefly reviewed.

On sugar-cane the disease caused by *C. sasakii* is of minor importance, affecting only the leaves and sheaths. *A. nardus*, however, cultivated for the production of citronella oil from the leaves, may suffer considerable injury during the rainy season of January and February. The crop is grown as a perennial and cut four times or more a year, so that control by excision and burning of the diseased material should not be an expensive measure. Careful inspection of the rooted segments used for propagation before transplanting is advisable to prevent the spread of the pathogen.

ABBOTT (E. V.). **Influence of certain environmental conditions on chlorotic streak of Sugar Cane.**—*Phytopathology*, xxxvii, 3, pp. 162–173, 1947.

Both in greenhouse and field experiments in Louisiana, chlorotic streak [*R.A.M.*, xxv, p. 82] developed more extensively in sugar-cane plants raised from infected cuttings in poorly drained soil than in comparable soil with proper drainage, while secondary spread of the disease was more prevalent in plants grown from healthy cuttings in ill- than in well-drained fields. There was no significant difference in the incidence of infection in the greenhouse among plants produced by infected bud cuttings in Sharkey clay silt and Yazoo very fine sandy loam.

Applications of a nitrogenous fertilizer to young plants raised from infected cuttings increased the development of foliar symptoms. Large doses of nitrogen (200 c.c. per plant of a solution containing 10 gm. sodium nitrate per l.) at fortnightly intervals from the age of two to eight months exerted marked curative effects on the C.P. 29/103 and 29/320 varieties, but not on the others included in the tests. In the absence of additional nitrogen, recovery was more marked in the same two varieties in muck than in clay soils.

ESFANDIARI (E.). **Deuxième liste des fungi ramassés en Iran.** [A second list of fungi collected in Iran.]—*Ent. Phytopath. appl.*, Tehran, 1946, 2, pp. 10–16, 1946.

This annotated list of fungi collected in Iran [cf. *R.A.M.*, xxi, p. 99] since the beginning of the late war supplements an earlier one that appeared in 1945, descriptions of all the new species having been published by Petrak in 1941 [ibid., xxvi, pp. 131, 173]. All the fungi mentioned are in a herbarium part of which is maintained at the École supérieure d'Agriculture, Karadj, and the remainder in the laboratory of the Ministry of Agriculture, Teheran. Among the items listed the following may be mentioned: *Pseudomonas savastanoi* on branches of olive, *Bacterium* [*Xanthomonas*] *malvacearum* on leaves and bolls of *Gossypium* sp., *Albugo* [*Cystopus*] *tragopogonis* [ibid., xxiii, p. 423] on leaves and stalks of *Tragopogon graminifolius*, *Sphaerotheca pannosa* var. *persicae* [ibid., xxiv, p. 107] on peach leaves and fruit, *S. pannosa* var. *rosae* [ibid., xxiii, pp. 90, 179] on fruits, peduncles, and thin stems of *Hulthemia* [*Rosa*] *persica*, *Leveillula* [*Oidiopsis*] *taurica* [ibid., xxiv, p. 343] on leaves of *Salvia pseudosylvestris* and other hosts, *Mycosphaerella tassiana* on ivy leaves, *Puccinia antirrhini* on *Antirrhinum majus* leaves, *Phragmidium iranicum* n.sp. on *Rubus caesius* [dewberry] leaves, *Phyllosticta jasminicola* on *Jasminum officinale*, *Sporonema punctiforme* on leaves of *Rubia tinctoria*, *Guignardia bidwellii* on vine, *Pestalotia theae* on tea [ibid., xxi, p. 324], *Helminthosporium gramineum* on wheat, and *Fusicladium dendriticum* [*Venturia inaequalis*] on apple leaves.

GOIDÀNICH (G.). **'Peyronellaea', nuovo genere di Deuteromiceti. (Nota preliminare.)** [*'Peyronellaea'*, a new genus of Deuteromycetes. (Preliminary note.)]—*R.C. Accad. Lincei*, Ser. VIII, i, 3–4, pp. 449–457, 3 figs., 1946.

The author erects a new genus [without a formal or Latin diagnosis] of Sphaero-

psidales, which he names *Peyronellaea* [see above, p. 343]. It includes a number of species hitherto ascribed to *Phoma* [cf. *R.A.M.*, xxv, p. 526], but showing certain morphological peculiarities, especially multicellular chlamydosporal structures [or hypnocysts; *ibid.*, ix, p. 240] resembling in appearance and shape the dictyospores found in hyphal Dematiaceae such as *Alternaria*, *Coniothecium*, and *Sporodesmium*. With these morphological peculiarities go others of a biological, physiological, and cultural nature, which render the group an individual, homogeneous, and distinct unity.

*Peyronellaea* spp. grow well on most media. The colonies are at first whitish or rose, then very dark, and characterized by an abundance of pycnidia, which may arise among the aerial chlamydospores or remote from them. On certain media they resemble Blastomycetes in the rapid multiplication by budding of the vegetative cells. The pycnidia mature in less than 64 hours, differentiation being either symphogenous or meristogenous.

The mature pycnidia are spherical, or, when they result from the confluence of different fruiting organs, irregular. Typically, they are ostiolate. In their final phase, the wall is thin and fragile. The pycnoconidia, which are unicellular, hyaline, ellipsoidal, and generally biguttulate, are not borne on conidiophores, but arise through budding of the cells lining the inside of the wall. Mucilage and spores fill the pycnidial cavity, being produced by a lysigenous process, and they emerge to form a reddish-yellow mass round the ostiole.

The chlamydospores, which become differentiated simultaneously with the pycnidia, are either 1- to few-celled (buds), or, more often, multicellular, very dark, opaque, and irregular but tending to be claviform; they are isolated or arranged in simple and branched chains. In spite of their close resemblance to the conidia of hyphal Dematiaceae they are true chlamydospores.

Species of Sphaeropsidales which the author considers should be referred to *Peyronellaea* (disregarding for the present questions of synonymy) include '*P. richardiae*' [cf. *ibid.*, i, p. 150; xvi, p. 106], '*P. conidiogena*' [*ibid.*, xxi, p. 315], '*P. alternariaceae*' [*ibid.*, xvi, p. 106], '*P. glomerata*' [*ibid.*, xix, p. 601], and '*P. scabra*'. The specific denominations of the following, which are based solely on the chlamydosporal forms, should be suppressed: *A. hominis* [*ibid.*, xvi, p. 749], *A. richardiae*, *A. polymorpha* [*ibid.*, xi, p. 374], and *C. scabrum*.

SPARROW (F. K.). Observations on Chytridiaceous parasites of phanerogams. II.

**A preliminary study of the occurrence of ephemeral sporangia in the Physoderma disease of Maize.**—*Amer. J. Bot.*, xxxiv, 2, pp. 94–97, 17 figs., 1947.

*Physoderma zeae-maydis* [*P. maydis*], the agent of brown spot of maize and teosinte [*Euchlaena mexicana*], in the southern United States, has been found to possess, besides the familiar macroscopic endobiotic resting spore stage, an epibiotic phase visible only under the microscope. Each of the numerous zoospores formed at the germination of the resting spore is potentially capable of producing a thin-walled, slipper-shaped sporangium, 13 to 36 by 10 to 15  $\mu$ , which rests on the outer surface of the plant and bears within the host cell a small apophysis and short, bushy rhizoidal system [*R.A.M.*, xiii, p. 691]. There is no organic connexion between the endobiotic and the epibiotic phases. The ephemeral sporangia produce numerous ellipsoid zoospores, 5 by 3  $\mu$ , furnished with a small, eccentric, refractive, colourless globule and a posterior flagellum, 15 to 20  $\mu$  in length, and differing only in their somewhat smaller dimensions from those arising from the germinated resting spores (7 by 5  $\mu$ ). By analogy with *P. menyanthis* [*Amer. J. Bot.*, xxxiii, pp. 112–118, 41 figs., 1946] it is probable that the zoospores produced by the ephemeral sporangia can reinfect maize. These organs are suspected of being gametes, but no evidence is yet forthcoming to corroborate this theory. Empty sporangia may produce a second crop of zoospores by internal proliferation. The

endobiotic system did not begin to develop until after the epibiotic phase had produced its spores.

SMITH (G.). **Note on the occurrence of species of *Oidiodendron* Robak in Britain.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 232–233, 1946.

Notes are given on two British species of *Oidiodendron* [*R.A.M.*, xii, p. 69] in the collection of cultures made by Nobel's Explosives Co., Ltd., at Ardeer, Ayrshire, and transferred in 1931 to the London School of Hygiene and Tropical Medicine. One (Ag 109), isolated from a lichen on a wooden post, is a typical strain of *O. rhodogenum* [loc. cit.]. Growth on all culture media is slow, velvety or tufted floccose, pale grey, with an overgrowth of dirty white sterile mycelium. On maize meal or wort agar the whole mass of mycelium gradually becomes blood-red. On other media, pigment production is sparse and spasmodic. Culture Ag 112, isolated from gun cotton, agrees well with *O. fuscum* [ibid., xvi, p. 575]. Growth is slow, grey to fuscous, powdery, and there is a dirty brown pigment in the medium. Another strain of *O. fuscum*, received from Dr. A. Burges, was isolated four times from the surface humus in a pine plantation. In view of the similarity of this genus, in the gross appearance of the conidial fructifications, to *Cladosporium*, it is probable that a search through the records of the latter genus would reveal the presence of other species of *Oidiodendron* in Britain.

TUBBS (F. R.). **Blister blight.**—*Tea Quart.*, xviii, 3, p. 90, 1946.

Blister blight of tea [*R.A.M.*, vii, p. 542] probably caused by *Exobasidium vexans* [ibid., xxvi, p. 317] has been reported in Ceylon for the first time after the relaxing of the regulations prohibiting the import of tea seeds. The outbreak began quite recently on the western face of the central range of hills and has spread to 68 estates. Its frequency is highest in tipping fields, decreasing with the age of the field from pruning. In North India the fungus has fortunately proved extremely susceptible to the frequent climatic changes and therefore serious damage has been avoided. Managers have been asked to advise the Tea Research Institute of disease outbreaks, extent of damage, and weather conditions during the attacks.

MARKHAM (R.), SMITH (K. M.), & WYCKOFF (R. W. G.). **Electron microscopy of Tobacco necrosis virus crystals.**—*Nature, Lond.*, clix, 4043, p. 574, 1 fig., 1947.

Photographs of single crystals of a strain of the tobacco necrosis virus [*R.A.M.*, xxvi, p. 174] examined through the electron microscope [ibid., xxv, p. 437] suggested, in their molecular net, a frayed piece of wire screening. Measurements across 10 to 20 molecular rows indicated that the same particle separation, *c.* 275 Å, prevails both vertically and horizontally. The particle rows are approximately at right angles (95°), but the net is not strictly cubic. The studies are being continued.

CLAYTON (E. E.). **A wildfire resistant Tobacco.**—*J. Hered.*, xxxviii, 2, pp. 35–40, 4 figs., 1947.

TL 106, a selection from the back-cross between *Nicotiana longiflora*, immune from wildfire (*Pseudomonas tabaci*) [*P. tabacum*: cf. *R.A.M.*, iv, p. 510], and the susceptible commercial tobacco, has been experimentally shown to combine an exceptionally high degree of resistance to the disease with freedom from water-soaking [ibid., xv, p. 537 *et passim*] and a uniform growth habit resembling that of the standard varieties. Among the F<sub>1</sub> progeny of crosses between TL 106 and five commercial varieties, only five out of 1,350 plants reacted positively to inoculation with the pathogen in 1946 compared with 100 per cent. in the

1,000 controls, while 600 TL 106 plants similarly exposed also remained healthy. This type of wildfire resistance, therefore, behaves as a complete dominant. Five lots of the  $F_1$  population of the crosses (in the green state) weighed 25, 28, 33, 34, and 51 per cent. more, respectively, than the paired controls of the susceptible parent. Three years' experimental evidence further indicates that TL 106 is highly resistant to *P. angulata*, but it is equally susceptible with commercial tobacco to a number of other diseases.

ASKEW (H. O.). **Lime-induced boron deficiency in Tobacco at Umukuri, Nelson, New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxviii, 3, pp. 161–166, 5 figs., 1946.

At the Tobacco Research Station, Umukuri, Nelson, a stunting of tobacco plants, accompanied by foliar chlorosis and curling, occurred on a coarse sandy soil in the second season after treatment with ground limestone at dosages of 1 and 2 tons per acre. The symptoms are reminiscent of those described by Van Schreven from Holland [*R.A.M.*, xiii, p. 600]. Analyses of soil samples showed that the limed areas contained only 0.1 p.p.m. boron compared with 0.2 for the untreated, while the boron contents of the leaves in the plots receiving 1 and 2 tons lime were 3.9 and 3.5 p.p.m., respectively, as against 6.3 in the untreated and 26.7 in those given borax at the rate of 20 lb. per acre. Growers are accordingly warned against the use of lime at rates exceeding  $\frac{1}{2}$  ton per acre in any one season on the soils in question.

SAMSON (R. W.). **Summer weather and Tomato blight.**—*Food Packer*, xxviii, 4, pp. 53–55, 5 graphs, 1947.

No record can be traced of outbreaks of tomato late blight [*Phytophthora infestans*] in Indiana prior to the destructive epidemics of 1945 and 1946 [*R.A.M.*, xxvi, p. 176 and next abstract], but the disease occurred on potatoes in eight out of the past 29 years, including the two in question. There are three jointly essential prerequisite conditions for the development of the pathogen on a scale of such magnitude, namely, an abundance of foliage, repeated alternations of temperature dropping to the fifties at night and reaching (but not exceeding) the low seventies by day, and the presence of moisture films on the plants for protracted periods. In 1945, the disease almost completely destroyed many tomato fields by mid-August in north and central Indiana, especially the former, where temperatures were below and rainfall above normal but caused little loss in the south, where more or less normal temperature and moisture conditions prevailed. In 1946, the wholesale introduction of the fungus on most lots of seedlings received in May and June resulted in serious failures of stand, costly replanting, and some diversion of the intended tomato acreage to other crops. This loss, however, was largely offset by a subsequent favourable growing season except in the south, where maturing crops sustained heavy reductions from late blight, correlated with abnormally low temperatures and high precipitation during July and up to late August. In 1915, the coolest and wettest summer since 1887, late blight must have been destructive in Indiana, and at least one canner does indeed recollect a situation comparable with that of 1945.

All the available evidence points to the source of tomato late blight in the shoots arising from infected potato tubers, since the pathogen does not overwinter in tomato seed, in the soil, or in dead plant tissue. It is possible, though unlikely, that direct transfer from severely blighted early potatoes to tomatoes in southern Indiana may have taken place in 1945 and 1946. The potato strain of *P. infestans* must traverse some six or seven adaptive cycles in the tomato, requiring a minimum of 30 days, before acquiring full virulence towards the latter host, and this process would be retarded by intervening periods of higher temperature or lower rainfall. It seems more probable, therefore, that adaption of the potato strain to tomatoes

occurred on winter crops in the south. The subsequent dissemination northwards may have been effected by means of direct shipments of seedlings, as in 1946, or by spread to successively later and more northerly plantings up through the Mississippi Valley in early spring.

The probably infrequent and unpredictable recurrence of late blight on Indiana tomatoes presents a real problem in the application of control measures, but five good sprays or dusts at ten-day intervals from early July onwards should insure the grower against late blight, the premium being paid with the increased yields and quality consequent on the simultaneous prevention of such diseases as leaf spot (*Septoria*) [*lycopersici*], early blight [*Alternaria solani*], and anthracnose [*Colletotrichum phomoides*].

COOK (H. T.). **Our method for forecasting Tomato late blight.**—*Food Packer*, xxviii, 5, pp. 69–70, 5 graphs, 1947.

Late blight (*Phytophthora infestans*), according to the Plant Disease Survey covering the 30-year period from 1917 to 1947, caused serious damage to the Virginia early potato crop in not more than two years (1938 and 1946) and to tomatoes in only one (1946) [see preceding abstract]. Routine control measures against a disease of such infrequent occurrence would not be sound practice, and a method has therefore been devised of warning growers several weeks in advance of the likelihood of outbreaks, based on their relation to the temperature and rainfall in May, June, and July in the State during the last 17 years. The data for those months are used because the first signs of the disease appear about 20th May. The initial development of infection would depend on the weather during the preceding fortnight and its subsequent course on a continuation of favourable conditions into June or possibly July.

The average weekly temperature was generally lower in the two blight years than in the 15 when it was absent, and remained below 75° F. about a week longer in the former than in the latter. The average cumulative rainfall beginning the second week in May was continuously heavier in 1938 and 1946 than in the other years covered by the Survey. It is proposed to make the forecasts, beginning the second week in May, by plotting the average weekly temperature and cumulative rainfall at weekly intervals on graph paper on which the median or 'critical' lines for those factors have been drawn. The 'critical' line for rainfall is drawn as nearly as possible half-way between the lines for blight and non-blight years, and the 'critical' temperature line at 75°.

Spraying or dusting will be recommended after a consecutive fortnight in May when both temperature and rainfall have been propitious to the development of the pathogen, and advice to discontinue control measures will not be issued until after a consecutive fortnight in which either or both these factors have been unfavourable. Had this method been available in previous years, prophylactic treatments would have been recommended in the two blight years as well as in two (1934 and 1943) when the disease did not occur, and the predictions would thus have been 88 per cent. correct with an error of two out of 13 years.

MCLEAN (D. M.) & BJORNSETH (E. H.). **Control of anthracnose on cannery Tomatoes; two years' results.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxviii, 4, pp. 287–293, 1 fig., 1946.

The ten-State co-operative trial in tomato anthracnose (*Colletotrichum phomoides*) control initiated in 1944 at the Ohio Agricultural Experiment Station [*R.A.M.*, xxvi, p. 36] was resumed in Michigan in 1945, when the following treatments were applied to a five-acre field of the Greater Baltimore variety: (1) Bordeaux 8–4–100, (2) zerlate 2–100, (3) fermate 2–100, (4) alternating fermate 2–100 and tribasic 4–100, beginning and ending with fermate in a five-application schedule at ten-day

intervals from 18th July onwards. Fermate alone gave the best control, reducing the percentage of infection from 10.6 in the untreated plots to 0.9, followed by zerlate (1.5) and the alternating sprays (2.4); Bordeaux was quite ineffectual (10).

In another test, using 200 plants of John Baer inoculated at the base with sterilized wheat cultures of the pathogen, five applications were made at ten-day intervals, starting on 27th July, with (1) zerlate plus calcium arsenate 2-4-100, (2) alternating fermate plus calcium arsenate 2-4-100 and tribasic plus calcium arsenate 4-4-100, (3) fermate plus calcium arsenate 2-4-100. The percentages of anthracnose in the plots treated with (1), (2), and (3) were 1.7, 1.7, and 4.2, respectively, as against 4.4 in the controls. In this experiment the control of *C. phomoides* was complicated by severe outbreaks of early and late blights (*Alternaria [solani]* and *Phytophthora infestans*), resulting in heavy defoliation, the percentages of which for treatments (1), (2), and (3) on 11th September were 14, 7, and 23, respectively, compared with 35 in the controls.

The following figures are taken from a summary by J. D. Wilson, of the Ohio Agricultural Experiment Station, of 13 experiments in the co-operative anthracnose control project: fermate plus calcium arsenate 2-4-100, 8.24 per cent. infection; zerlate plus calcium arsenate 2-4-100, 6.82; fermate and tribasic alternating, 7.49; and untreated, 20.34, the corresponding yields (in tons per acre) of saleable fruit being 10.45, 10.92, 11.28, and 9.28, respectively.

GÄUMANN (E.) & JAAG (O.). **Die physiologischen Grundlagen des parasitogenen Welkens. I.** [The physiological bases of parasitogenic wilting. I.]—*Ber. schweiz. bot. Ges.*, lvii, pp. 3-34, 3 diags., 13 graphs, 1947. [French summary.]

Using an experimental method enabling the absorption of water by detached tomato shoots and their cuticular and stomatal transpiration to be continuously followed under constant external conditions (*Ber. schweiz. bot. Ges.*, xlv, pp. 411-518, 1936), the authors distinguished four phases in the toxic action of lycomarasmin, a wilting substance secreted by *Fusarium [bulbigenum* var.] *lycopersici*, the agent of tomato wilt [*R.A.M.*, xxvi, p. 220]. In the first place, the addition of the toxin to the nutrient solution induces a 'shock' phase, lasting two to three hours and expressed only in the simultaneous diminution of water absorption and transpiration resulting from a disturbance of the water balance. The lycomarasmin concentration does not affect the moment of occurrence of the 'shock' effect but merely its intensity: at  $10^{-2}$  M lycomarasmin, for instance, the water-absorption and transpiration curves sink to about one-third and at  $10^{-3}$  to two-thirds of the initial values, whereas at  $10^{-4}$  and  $10^{-5}$  the influence of the toxin is barely perceptible.

On recovery from the 'shock', the water-absorption and transpiration curves tend steeply upwards, indicating a phase of temporary intensification, notably of transpiration, which may exceed absorption by half as much again. During the 'shock' phase, therefore, supplementary moisture from the cell contents must have entered the transpiration stream, a process reflected in the reduction of the total fresh weight of the shoot.

After five to eight hours the phase of temporary excess of transpiration comes to an abrupt end and is succeeded by collapse of the water economy. The transpiration and water-absorption curves now sink continuously at all the lycomarasmin concentrations tested ( $10^{-2}$  to  $10^{-5}$  M), and since the amount of water lost constantly exceeds that taken up, there is a further reduction in the fresh weight of the shoot. At  $10^{-2}$  and  $10^{-3}$  M lycomarasmin an irreversible pathological wilting develops, the symptoms of which appear immediately or within five hours after the culmination of transpiration at the higher dosage and in ten hours at the lower one.

The theory is postulated that the primary cause of the pathological wilting does not lie in the loss of water, but that both the wilt and the water deficit are a sequel to the pollution of the host cell protoplasts by the toxic metabolic products of the fungus, and more especially to the deterioration of the semi-permeability of the plasma membrane. The 'shock' effect coincides with the infiltration of lycomarasmin into the tissues. At concentrations of  $10^{-2}$  and  $10^{-3}$  M lycomarasmin the plasma layers are damaged to such an extent that some of the protoplasmic constituents pass into the transpiration stream. The superfluity of water leads to the temporary excess of transpiration, and the extrusion into the transpiration stream of cellular substances disorganizes the osmotic conditions contributing to turgor and results in irreversible pathological wilting. At the lower concentrations of  $10^{-4}$  and  $10^{-5}$  M, the toxin merely disturbs the water economy of the protoplasts, the semi-permeability of the plasma membranes remaining intact. This mal-adjustment induces a permanent excess of transpiration but no pathological wilting.

Light appears to be a decisive factor in the development of wilt under the influence of lycomarasmin at  $10^{-3}$  M, no pathological symptoms developing in darkness at this concentration and the same water loss.

DODGE (B. O.). **The brooming disease of Walnut.**—*J. N.Y. bot. Gdn*, xlviii, 569, pp. 112–114, 2 figs., 1947.

During the summer of 1942, several witches' brooms were formed on young Japanese walnut (*Juglans sieboldiana*) in the New York Botanic Garden. They consisted of numerous proliferations at intervals along the larger branches and at their ends, the leaves at these points being much stunted and otherwise deformed. The excrescences were removed periodically and no fresh ones developed until 1945, when about a dozen appeared on the lower branches and a larger broom on a lateral branch near the top of the main stem. During the early summer of 1946 many new outgrowths were produced along most of the limbs, large masses of malformed leaves and flower clusters combining to make up the brooms. The new brooms grow up vertically like the suckers of peach trees affected with the yellows virus. In March, 1947, the dried pistillate inflorescences were still persisting.

A similar disease observed by L. M. Hutchins and H. V. Wester on walnuts and butternuts [*J. cinerea*] in the eastern United States was found to be graft-transmissible, and in the absence of a visible pathogen is attributed by these workers to virus agency (*Phytopathology*, xxxvii, p. 11, 1947). This would seem to be a plausible explanation of the New York walnut disease, which is therefore systemic and should be combated by the extirpation of affected trees.

TWYMAN (E. S.). **Notes on the die-back of Oak caused by Colpoma quercinum (Fr.) Wallr.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 234–241, 1 pl., 3 figs., 1946.

*Colpoma quercinum* is a phacidiaceous, inoperculate Discomycete which causes a die-back of young oak-trees, coppiced oak, and the smaller terminal branches of older trees. Apothecia usually occur on dead twigs and branches, but sometimes may be found on the diseased side of a living branch. The apothecial hymenium consists of clavate asci measuring 130 to 150 by 9 to 10  $\mu$ , with bluntly pointed apices and paraphyses with curled tips. The asci contain eight hyaline elongated spores measuring 15 to 115 by 1.5  $\mu$ . The mode range of ascospore length is 40 to 65  $\mu$ .

The acervuli of the type of the Melanconiaceae appear on newly infected twigs before the apothecia, but are usually closely associated also with young apothecial rudiments. The shape of an acervulus is that of a truncated cone with a basal

layer of pseudoparenchyma 0.04 to 0.05 mm. thick. From the centre of this a pseudoparenchymatous cone extends upwards towards the opening, through which it sometimes protrudes. Conidiophores  $50\ \mu$  long arise from the basal parenchyma on each side of the core. Under the periderm, immediately above the conidiophores and conidia and extending from the opening to the edge of the basal parenchyma, is situated a thin web of loose hyphae which remains in position if the periderm is carefully removed. Under this thin layer of fungal tissue, the five to seven locules of the acervulus appear radially round the dark brown central core of pseudoparenchyma. The locules are delimited from the host tissue by a thin layer of black pseudoparenchyma, and the conidia are extruded from the ruptured periderm as a cream or reddish globular mass.

Measurements of 1,600 conidia from agar cultures showed that the spore lengths had a mode range of 3.9 to 4.8  $\mu$  with a variation of 2.4 to 7.3  $\mu$ . The mode range of the length of spores from naturally infected material was 4.4 to 5.3  $\mu$ . Observations suggested that the conidia arise in basipetal succession. The branched or unbranched conidiophores vary greatly in length. Sometimes numerous branched conidiophores and sterile hyphae become grouped, forming an elongated coremial-like structure terminating in a few sterile hyphae.

In diseased wood the mycelium travels longitudinally in the vessels and tracheids and radially in the cells of the medullary rays. Black lines, formed by aggregated, brown-walled, inflated hyphae filling the lumina of cells of the xylem and pith are present in the diseased stems. If the periderm was removed, a line could be seen surrounding one or more apothecia, under which was a pocket of diseased wood completely delimited by a black zone. This passed radially into the wood and joined up with others running in a longitudinal direction. The mycelium destroys the phloem and cortex, but the periderm is not attacked. A gum barrier laid down between infected and healthy wood was found to contain a ligno-tannin complex.

ROBERTSON (N.) & MACFARLANE (I.). **The occurrence of perithecia of the Oak mildew in Britain.**—*Trans. Brit. mycol. Soc.*, xxix, 4, pp. 219–220, 1946.

In October, 1945, the authors found six perithecia of the oak mildew on a living leaf of oak (*Quercus robur*) at Bricketwood, Hertfordshire. The fungus belonged to *Microsphaera*, and showed elliptical to barrel-shaped conidia measuring 25 to 37 by 15 to 22 (average 31 by 19)  $\mu$ , perithecia 180 to 200  $\mu$  in diameter, with 20 to 24 appendages 170 to 300  $\mu$  long, and spores (20 from three perithecia) measuring 18 to 24 by 6 to 13  $\mu$ . As the fungus agrees closely with the description of the original authors and also with that of Blumer (*Beitr. zur Kryptogamenflora der Schweiz*, p. 316, 1933) it is provisionally identified with *M. alphitoides* [*R.A.M.*, viii, p. 411]. It agrees closely with *exsiccatu*s no. 3099 of Sydow's *Mycotheca Germanica*, issued as *M. alphitoides*. The average diameter of the perithecia found at Bricketwood is 180  $\mu$ , as against Blumer's 116 (range 103 to 130)  $\mu$ , but the other characters are the same. One collection of *M. densissima* (from New York) was seen from which it was difficult to differentiate *M. alphitoides* on morphological grounds alone, though the distal dichotomy of the appendages in *M. densissima* appears to be more elaborate. This last character is variable, however, and perithecia were observed in which the appendages closely resembled those of the authors' specimens and Sydow's 3099. The type collection of *M. alphitoides* is the perithecial material collected by Arnaud and Foëx and identified by them with the American *M. quercina* [*loc. cit.*]. Since the first discovery of the perithecia in 1911, the descriptions and collections of the oak mildew in Europe have been consistent, the fungus is distinctive among the oak mildews for its thick, white mycelium and it is more or less confined to the European oaks, with records on beech and sweet chestnut. In view of this consistency, it would appear to be advisable to maintain

*M. alphitoides* as the name of the European oak mildew until further work on the American forms has settled its identity.

URQUIJO (P.). **Sobre las diferentes estirpes de *Phytophthora cambivora* (Petri) Buisman y su distinta resistencia al cobre.** [On the different strains of *Phytophthora cambivora* (Petri) Buisman and their individual resistance to copper.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiv, pp. 315–320, 1 fig., 1 graph, 1946.

In tests on the individual reaction to copper sulphate of eight strains of *Phytophthora cambivora*, the agent of chestnut ink disease [*R.A.M.*, xxiii, p. 375], Petri's and Leonian's were the most sensitive, succumbing to a dose of 1 in 200,000, followed by Dufrénoy's (1 in 50,000) and the *Juglans* isolate (1 in 30,000), while concentrations of 1 in 10,000 were necessary to destroy the isolates from *Castanea dentata*, *Erica*, Coruña, and Meirás. To ensure the efficacy of the curative treatment with copper oxychloride or copper carbonate, the trunk and roots should be given a preliminary washing with a solution of copper sulphate (minimum strength 2, preferably 4 per cent.) at pH 5.

The above-mentioned differences in sensitivity to copper of the eight isolates of *P. cambivora* under observation provide an important taxonomic criterion, on the basis of which they fall into three groups, (1) isolates from *C. dentata*, *Erica*, Coruña, and Meirás, withstanding copper concentrations of 1 in 20,000; (2) the Dufrénoy and *Juglans* isolates, resistant to 1 in 100,000; and (3) those of Petri and Leonian, succumbing to dosages above 1 in 300,000. These new observations would appear to necessitate a revision of the specific nomenclature of the fungus, applying *P. cambivora* to Petri's and Leonian's strains and *P. verrucosa* [ibid., xx, p. 91] to the *C. dentata*, *Erica*, Coruña, and Meirás isolates; Dufrénoy's is probably a variant of the former species and the *Juglans* isolate of the latter.

CARTER (J. C.). **Tubercularia canker and dieback of Siberian Elm (*Ulmus pumila* L.).**—*Phytopathology*, xxxvii, 4, pp. 243–246, 1 fig., 1947.

*Tubercularia ulmea* n.sp., the agent of a canker and die-back of the Siberian elm (*Ulmus pumila*) in Illinois, produces on the diseased bark erumpent, pulvinate, scattered or gregarious, black sporodochia, of a horny consistency when dry, up to 1.5 mm. in diameter and 0.9 mm. in height; hyaline, irregularly ramose, crowded conidiophores, straight or strongly curved, 35 to 87 by 1 to 3.5, mostly 45 to 65 by 1.5 to 2.5  $\mu$ , with branches 4 to 10 by 1 to 1.3  $\mu$ ; and acrogenous, hyaline, continuous, ovoid to oblong, occasionally allantoid conidia, 3.8 to 9.3 by 1.4 to 3.4, mostly 4.6 to 6.2 by 1.5 to 2.3  $\mu$ .

The cankers on the branches and trunks appear during April and May in the form of oval to elongated, slightly sunken areas. The surface of the infected bark assumes a reddish-brown tinge and becomes dotted with black sporodochia, the interior turning brown to black as it dies and shrivels. The cankers continue to expand until mid-June, when callus tissue begins to develop at their margins. Cracks may form in the diseased bark, often at the border of the canker, as the callus tissue spreads over the infected area. The diseased bark is pushed outwards, breaks, shreds, and usually peels off before the process of callus formation is complete. None of the cankers, either natural or artificial, under observation enlarged in succeeding years.

*T. ulmea* was found developing in the bark of diseased Siberian elms in both nursery and ornamental plantings, and on twigs dying from excess of shade in the inner part of the crown.

Six out of seven trunk and 17 out of 18 branch inoculations made in April, 1940 on 21 trees were successful, the disease thus induced pursuing a similar course to that described for the natural infections. Many of the inoculated branches were

girdled by the fungus and died distal to the site of invasion within 35 days. Callus had formed over most of the smaller cankers by late August, but the larger ones were not completely covered for one or two years.

PARKER (K. G.), TYLER (L. J.), WELCH (D. S.), & POPE (S.). **Nutrition of the trees and development of Dutch Elm disease.**—*Phytopathology*, xxxvii, 4, pp. 215–224, 1947.

The results of experiments on small elm (*Ulmus americana*) trees potted in a very poor Gloucester loose soil at Cornell University, Ithaca, New York, indicated that a complete fertilizer treatment (5:10:5) may mitigate the severity of infection by *Ceratostomella ulmi* [cf. *R.A.M.*, xix, p. 559]. The soil treatments should not be excessive and should be well balanced. Nitrogen and phosphorus, especially the latter, appeared to be of major importance in promoting vigorous growth of the trees, the role of potassium being subsidiary, though this element did produce a beneficial effect in the particularly inadequate soil used in the tests. Experiments on larger trees in the open showed similar results but the growth differences and differences in disease development were less. When a good response to complete fertilizer was obtained the disease was less severe than in unfertilized poorly growing controls. No clear-cut differences could be observed between the various sources of nitrogen employed, namely, sodium nitrate, urea, or a mixture of urea and farmyard manure. There appeared to be no danger in maintaining the trees in good condition, provided they are not drastically pruned and a succulent growth is produced. It is thought that differences in the hydrogen-ion concentration of the soil may provide a clue to the variations in the development of the disease, but this aspect of the subject demands closer investigation.

GOIDÀNICH (G.). **Il problema della grafiosi dell' Olmo nella fase risolutiva.** [The problem of graphiosis of the Elm in its destructive phase.]—Reprinted from *Ann. Accad. Agric. Bologna*, N.S., i, 23 pp., 13 figs., 1941. [Received May, 1947.]

In this paper, read before the Bologna Academy of Agriculture on 1st December, 1939, the author gives a succinct yet comprehensive account of Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xxv, p. 530; and preceding abstract], with particular reference to Italian conditions. The points dealt with include the external and internal symptoms of the disease, parasitism of *C. ulmi*, etiology, predisposing factors, and control by the use of resistant varieties.

THIRUMALACHAR (M. J.), NARASIMHAN (M. J.), & GOPALAKRISHNAN (K. S.). **Morphology of spore forms and heteroecism of the Giant Bamboo rust, *Dasturella divina*.**—*Bot. Gaz.*, cviii, 3, pp. 371–379, 12 figs., 1947.

Throughout large forest tracts in South India the giant bamboo (*Dendrocalamus strictus*) is heavily parasitized by the uredo- and teleutosori of *Dasturella divina* [*R.A.M.*, xxii, p. 454], the pycnidia and aecidia of which are formed on *Randia dumetorum*. The genetic connexion between the alternate stages of the rust was first surmised from this constant association in bamboo forests and was later demonstrated by inoculation experiments. The systemic invasion of *R. dumetorum* is followed by marked hypertrophy and the formation of witches' brooms. Aecidiospores from the alternate host infected the leaves of the giant bamboo, the incubation period ranging from 27 to 34 days, while uredospores were responsible for the further spread of the disease.

Contrary to the observations of Mundkur and Kheswalla [loc. cit.], the senior author found that the teleutosori are composed of unicellular, catenate spores produced in basipetal succession. The accommodation of the genus in Dietel's tribe Ochrosporeae is proposed.

SCHWARZMAN (MME S. R.). О НОВОМ ВИДЕ гриба. *Cenangium kazachstanicum* Schwarz. sp.n. [On the new fungus species *Cenangium kazachstanicum* Schwarz. n.sp.]—*Bull. Soc. Nat. Moscou*, li, 4–5, pp. 137–145, 1 fig., 1946. [English summary.]

*Cenangium kazachstanicum* n.sp., the agent of a die-back of Scots pines (*Pinus sylvestris*) in the Akmolinsk district of North Kazakhstan, U.S.S.R., first observed in 1932 and causing heavy mortality from 1938 to 1942, was shown by a comparative morphological study to differ in the following particulars from *C. abietis* [R.A.M., xxv, p. 283] and its vars. *japonica* and *olivaceo-nigra*. The ascospores of *C. kazachstanicum* may be either hyaline or brown, the former measuring 6.4 to 10 by 4.8 to 6.8 and the latter 7.5 to 12 by 5.3 to 8  $\mu$ , whereas those of *C. abietis* and its vars. *japonica* and *olivaceo-nigra* are uniformly colourless, hyaline to pale yellow, and hyaline, respectively, and measure 10 to 12 by 5 to 7, 10 to 12 by 7 to 8, and 12 to 13 by 4 to 4.5  $\mu$ , respectively. The hyaline to yellow-cinnamon paraphyses of *C. kazachstanicum* measure 4.5  $\mu$  and those of *C. abietis* and its var. *japonica* (which are colourless) 6 and 1.5 to 2  $\mu$ , respectively. The average dimensions of the apothecia of the new species, *C. abietis*, and its two varieties are 1.3 by 1.1, 1.5 to 3, 1.5 to 2.5, and 2 to 4 mm., respectively.

ZABEL (R. A.). *Poria obliqua* on dying Beech.—*Phytopathology*, xxxvii, 3, pp. 189–190, 1 fig., 1947.

Near Tully, New York, in August, 1946, a fertile fruit body of *Poria obliqua* [R.A.M., xxii, pp. 157, 184] was observed on a dying beech (*Fagus grandifolia*) trunk, in cross-sections of which black zone lines were detected separating advanced from earlier stages of decay [ibid., xviii, p. 145]. In areas of living sapwood the zone lines were cinnamon-brown, less distinct, and appreciably wider than elsewhere. The lumina of many cells in the zone lines were found on microscopic examination to be filled with swollen, brown hyphae, while others appeared to contain an amorphous, dark-coloured substance. A thin mycelial mat, composed of brown, thick-walled hyphae, was present at the edges of the sporophore a little nearer the heartwood than the black zone line. As the fruit body developed, it forced off the decayed and a layer of the sound sapwood up to 10 mm. in thickness. The sporophore was in close contact with the living sapwood.

The presence of *P. obliqua* on a still-living tree suggests the advisability of removing live material bearing sterile, rimose 'conks' from the forest in the course of sanitation cuttings.

BOUDRU (M.). La crise du Pin laricio de Corse en Belgique. [The Corsican Pine crisis in Belgium.]—*Bull. Soc. for. Belg.*, liv, 2, pp. 49–94, 7 figs., 1947.

After stating that plantations of Corsican pine [*Pinus nigra* var. *calabrica*] in various parts of Belgium have since 1939 shown a form of wilt associated with a rather high mortality, the author gives a detailed account of the condition and of the following fungi found on cracks and swellings in the bark of the affected trees, viz., *Dasyscypha calyciformis* [R.A.M., xxii, p. 413] at Raevens, *Crumenula pini-cola* [ibid., xxv, p. 587] at Genck, and *C. abietina* [ibid., xxv, p. 283 and next abstract], not before observed in Belgium, at Koursel, at Exel, and generally in the eastern part of the Campine.

Investigation showed that in every case the wilt and resultant mortality were due primarily to frost injury sustained during a succession of exceptionally severe winters, the fungi being either saprophytic or only weakly parasitic. The paper concludes with a full discussion of the suitability of *P. nigra* var. *calabrica* to the climatic conditions prevailing in Belgium.

BOUDRU (M.). **Note sur la fréquence, en Belgique, de *Crumenula abietina* Lagerberg.** [Note on the frequency in Belgium of *Crumenula abietina* Lagerberg.]—*Parasitica*, ii, 4, pp. 113–115, 1946.

Further observations are recorded on *Crumenula abietina* [see preceding abstract] in Belgium, including a preliminary list of the new conifer hosts on which it has been observed.

BOUDRU (M.). **L'état sanitaire, en Belgique, du Sapin de Douglas (*Pseudotsuga taxifolia* Britt.).** [The sanitary condition in Belgium of the Douglas Fir (*Pseudotsuga taxifolia* Britt.).]—*Parasitica*, ii, 4, pp. 125–127, 1946.

This is a brief review, from the literature, of the distribution in Belgium of *Rhabdocline pseudotsugae* [R.A.M., xxi, p. 434], *Phomopsis pseudotsugae* [ibid., xix, p. 178], and *Phaeocryptopus gaeumanni* [ibid., xxvi, p. 221], attacking Douglas fir (*Pseudotsuga taxifolia*). *Phomopsis pseudotsugae* has not been found by the author in Belgium but *R. pseudotsugae* is prevalent in the following localities; Mont-lez-Malmédy, Tervueren, Hoeylaert (Groenendael), Serinchamps, Gedinne, Spa Wijnchael, and Beverloo. Three localities are added to the previous list for *Phaeocryptopus gaeumanni*.

PETRINI (S.). **Om Granrötans inverkan på avverkningsens rotvärde. Specialundersökningar i Lanforsbeståndet 1938 och 1941.** [On the influence of Spruce root rot on the yield from clear-cutting. Special investigations in the Lanfors stand 1938 and 1941.]—*Medd. Skogsförsöksanst., Stockh.*, xxxiv, pp. 327–340, 1 graph, 1946. [German summary.]

In connexion with a systematic registration of increment and clear-cutting in a practically pure spruce stand, attention was paid to the damage to the felled trees from the prevalent root rot in Sweden caused by *Fomes annosus* [see next abstract], which was assessed by comparing the actual with the potential value of each trunk. The results showed an average reduction in the 269 trees felled in 1938 of 10·6 per cent., the corresponding figure for the 372 cut down in 1941 being 9·6, or 7·7 restricting the calculations to exactly the same areas in both years, whence it appears that the worst-damaged trees were eliminated at the first cut. It should be noted that healthy trees are also comprised in the thinning-out necessitated by the regeneration programme and included in the average figures.

A relationship was calculated between the extent of the rot on the one hand and the percentage reduction in value of the damaged tree on the other. The material consisted of 209 trees with root rot, using as indicator the percentage of tree length, reckoned from the base upwards, rendered valueless either for logs or wood pulp by *F. annosus*. Sorting was effected *in situ*, the damaged portion of the trunk being sawn off and used as firewood. Up to 40 per cent. decay the value of the wood sank fairly rapidly, more so in the class of 30 to 40 cm. at breast height than in that of 15 to 20 cm., but an incidence of rot exceeding 50 per cent. was not accompanied by a parallel devaluation.

RENNERFELT (E.). **Om rotrötan (*Polyporus annosus* Fr.) i Sverige. Dess utbredning och sätt att uppträda.** [Concerning root rot (*Polyporus annosus* Fr.) in Sweden. Its distribution and mode of occurrence.]—*Medd. SkogsforskInst., Stockh.*, xxxv, 8, pp. 1–88, 17 figs., 16 diags., 1 graph, 1 map, 1947. [German summary.]

Some of the information in this comprehensive study of root rot (*Polyporus* [*Fomes*] *annosus*) [see preceding abstract] in Sweden has already been noticed from another source [R.A.M., xxv, p. 374]. The growth rate of the mycelium was determined by inoculation into spruce stems: the maximum distance from the site of

entry traversed in two years was 132 cm. Of 784 increment cores obtained by sterile drilling in different parts of the country, 440 were infected by *F. annosus*, and from 213 (48 per cent.) of these the fungus developed in pure culture, the remainder being contaminated by extraneous organisms, including such agents of blue stain (29 or 7 per cent.) as *Cladosporium herbarum*, *Pullularia pullulans*, *Alternaria*, *Ophiostoma* [*Ceratostomella*] and *Phialophora* spp. and hyaline mycelia, e.g., of the moulds *Penicillium* and *Trichoderma* spp. (64, or 14.5 per cent.). Other wood-destroying fungi cultured from 328 of the cores, mostly collected in the interior of Norrland (or Lapland), included *Armillaria mellea* (11), *Polyporus* [*Fomes*] *pini* (18), *Stereum sanguinolentum* (19), and *Coniophora* spp. (21).

*F. annosus* is prevalent in forests with an undergrowth of *Vaccinium myrtillus* and *V. vitis-idaea* [cf. *ibid.*, xxv, p. 193], while heavy infection has also been observed on permeable and dry soils. No direct correlation could be established between root rot and the hydrogen-ion concentration texture, or structure of the soil. In 20- to 30-year-old pine stands in the south-west of Sweden the disease assumes a devastating form; at 50 years and upwards the trees are mostly resistant, but deaths have been observed among them.

**HARRINGTON (T.). Some aspects of timber preservation with water-soluble preservatives.**—*Timb. News Sawm. Engrn.*, lv, 2092, pp. 51, 70, 1 fig., 1947.

Recent developments in timber preservation by means of water-soluble preservatives are briefly surveyed, with special reference to Wolman salts [*R.A.M.*, xxv, p. 324], the chromium constituent of which has non-corrosive as well as fungicidal properties. This is a matter of some importance in view of the fact that the cost of a modern timber pressure impregnation plant, with its one or more pressure cylinders, measuring vessels, vacuum chests, pumps, and large-capacity storage tanks, is in the region of £10,000 to £15,000. Experiments are now in progress to obtain deep penetration by the use of very high pressures (up to 1,000 lb. compared with the normal 200 lb. per sq. in.). Both the Boucherie and Osmose processes [*ibid.*, xxi, p. 235; xxii, p. 84], which give good sapwood penetration, require the co-operation of the forester which is freely available in Germany and elsewhere and should be encouraged in this country.

**Service and regulatory announcements. October–December 1945. Plant quarantine import restrictions.**—*S.R.A.*, *B.E.P.Q.*, *U.S. Dep. Agric.*, 165, pp. 76–77, 78–81, 1945. [Received July, 1946.]

Proclamation No. 48 of 1940 repeals Proclamation No. 155 of 1939 [*R.A.M.*, xviii, p. 832], thus restoring the regulations regarding the import of potatoes into South Africa to those cited on p. 6 of *B.E.P.Q.* 471. A Customs rebate on duty is made on production of a certificate declaring that the potatoes were grown without risk of infection and that they were sufficiently free from virus diseases to ensure suitable progeny for seed purposes.

A summary is given of the plant-quarantine import restrictions embodied in the Statutory Rules and Orders No. 37 of 1942 and No. 5 of 1944 which prohibit the importation into Dominica of citrus fruits, cotton, and cotton products from the United States and certain other countries. The importation of the following plants and their parts is prohibited except under permit: banana, cacao, citrus species, coco-nut, sugar-cane, coffee (except roasted), gramineous plants except straw used as packing material, plants in soil, and soil and dung containing earth debris. Fruit and all parts of allspice [pimento] (*Pimenta* spp.) are not allowed to be imported from the Greater Antilles on account of *Puccinia psidii*. Plant material (with the exception of certain products) is not permitted to enter by air express.